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SOME PROBLEMS OF POPULATION GROWTH.*

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The greatest phenomenon of recent times is the present European war. That war is, in considerable measure, the outgrowth of present or anticipated pressure of population upon means of subsistence. The problems which are most seriously engaging the attention of the present federal administration are the maintenance of our rights as a neutral nation, the increase of armament, the expansion of export trade, and the improvement of rural credit facilities. All four of these problems arise largely from population growth. Though economists and sociologists very generally recognize that increase in population brings serious problems in its train, the same is by no means true of the great majority of the American people. Even though little that is new can be said on the subject, its vital character makes repetition and emphasis from time to time desirable.

One of the most striking features of modern history has been the rapid increase in the numbers of the white race, or what may be called the European stock. The white population of the earth approximately trebled during the nineteenth century. In Europe itself the increase has been great, but there has been an enormous overflow into other continents. Most of all has the European stock found room for expansion in the United States. But elsewhere in the Americas, in Australia, in South Africa, and in North Asia, it has also settled in considerable numbers. No equal period of time ever

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witnessed such an amazing rate of population growth on such a large scale.

This phenomenon of the expansion of the world's white population has been the more remarkable because there occurred at the same time a marked advance in the standards of living of that population. Instead of feeling a growing pressure of numbers on natural resources, the European stock enjoyed increasing abundance for the average man. Prosperity reigned. People grew to laugh at the gloomy forebodings of Malthus as to the effects of population growth. But the past offers no guarantee for the future in this respect. The coincidence of enormous increase in numbers with a rising standard of living was due in part to rapid progress in methods of production both in agriculture and in other industries, but in at least equal measure it was attributable to that geographical expansion to which reference has been made. Obviously such geographical expansion must ultimately find its limit. Already, in fact, the point has been reached where further geographical expansion meets with increasing difficulty.

At the beginning of the nineteenth century, a large part of the fertile temperate regions of the earth was still virtually unoccupied. Discovery and improvements in transportation brought enormous rich areas suddenly into the service of the European stock. Hundreds of millions of acres of excellent land in the United States, in Canada, in the Argentine, and elsewhere were brought into cultivation by European settlers and their descendants. This new land for the most part was quite as productive as the best of Europe itself. Geographical expansion of agricultural production for a long time involved no descent to inferior lands with consequent diminishing returns to labor.

Within the most recent years, however, the extension of agricultural areas has begun to invade less eligible fields. The temperate regions of the globe, within which only has the white race found it possible to live in large numbers, offer no further prospect of such magnificent additions to agricultural resources as took place during the eighteenth and nineteenth centuries.

It is true that there are in the temperate zone enormous areas

of land which are but thinly populated, which are as yet unused or but slightly used for agricultural production. The areas in which there is any considerable density of population are but a small fraction of the total land surface of the earth or even of the land surface of the temperate regions. But the great bulk of these undeveloped lands is seriously handicapped in one way or another. There are vast regions which are entirely desert and only a small fraction of which can ever be reclaimed by irrigation. Other great regions are too mountainous or rocky ever to contribute greatly to agricultural production. There remain, to be sure, hundreds, if not thousands, of millions of acres which are more capable of agricultural use, but for the most part even these are decidedly inferior to the better parts of Europe and America. They suffer from partial aridity, from cold, from lack of drainage, from poverty of soil, or from unfavorable configuration. Very little of the unoccupied area of the temperate zone can be compared for a moment with the splendid Mississippi valley, for example. Broadly speaking, in that zone labor of a given grade of efficiency will hereafter produce less per man with each further geographical extension of agriculture. Moreover, apart from the question of production, the comfort of human life in these areas remaining for settlement will in general be much lower than in present regions of large population.

Consider for a moment the characteristics of some of the largest temperate areas which remain undeveloped. First of all, the United States. Only one fourth of the total land area of this country is under cultivation, and less than half is in farms at all. Nevertheless, the unused or slightly used lands are either permanently deficient in some of the qualities essential to the best agricultural results, or they require great investment of capital to make them satisfactory agents of production. In fact, such geographical extension of agriculture as has taken place in this country in the last decade or two has for the most part been under distinctly unfavorable conditions.

From 1900 to 1910, 64,000,000 acres were added to the improved farm land of the United States—an increase of 15 per cent. Of this total, 54,000,000 acres, or fully five sixths, were

west of the 95th meridian; that is, west of the first tier of states on the further side of the Mississippi river. The great bulk of this new uncultivated land was in fact west of the 100th meridian. That meridian marks substantially the limit of normal humidity. West of it, irrigation or dry farming is in most cases necessary to make land productive. Irrigation, save in a few favored localities, requires very heavy investment of capital; the results of the more recent projects have not been altogether encouraging. Dry farming gives far less yield per acre per year and usually less production per man than farming under conditions of normal rainfall. The increase of our agricultural production through geographical extension during recent years has been accomplished only at increasing unit cost.

Much is expected of the enormous area of Canada. Great areas in the west and in the north of that country can unquestionably be brought under cultivation. But in much of this territory the rainfall is not sufficient to assure the regular production of good crops, and in most of it the cold is a serious handicap both to production and to comfortable living. The life of the farmer in a region where for months the days are exceedingly short and the cold intense—often falling to 40 or 50 degrees below zero—can hardly be considered a thing of joy. Even more unfavorable are the conditions in the vast unsettled areas of Siberia. Turning to the southern hemisphere we find a great proportion of Argentina, of South Africa and of Australia cursed with drouth. In fact, it is evident that, were there anywhere in the temperate regions large areas of good land still available for settlement, the people of the United States would scarcely be extending their agriculture into regions so ineligible as those where lie the greater part of the recent additions to our own cultivated area.

Another evidence of the fact that high grade agricultural lands are no longer readily being added to the world's use is found in the great advance in the prices of farm products and of farm lands, particularly in the United States. Grounds appear for the suspicion that in the last decade or two the standard of living of the working classes in this country, other than the farm owners themselves, has ceased to rise, if it has

not actually fallen, and that this change in tendency is due essentially to the filling up of our territory. Everywhere we hear bitter complaints of the high cost of living. By this is meant, of course, higher cost of living, decreased buying power of income. Prices have advanced rapidly, but advance in prices *per se* does not mean higher cost of living. It is unequal advance for different classes of commodities, or disparity between increase of wages and that of commodity prices, which gives real ground for dissatisfaction. The general advance in prices has been due primarily to the increased production of gold. The general tendency of wages and salaries to lag behind commodity prices when the supply of money is augmented, is the source of much of the higher cost of living. But no small part of it, at least in the United States, is due to the fact that agricultural products have risen faster in price than other products.

The accompanying table brings out the situation. The figures represent average index numbers of wholesale prices, duly weighted, for 1912 and 1913, the base in each case being the average prices for 1890 to 1899. The year 1914, in which prices of farm products were much higher still, is not used because of the possibly abnormal conditions due to the war. The data are compiled from the latest bulletin of the Bureau of Labor Statistics on wholesale prices, in which the methods of computation have been revised and made more scientific.

Under the heading, "farm products," in this table are included a number not so classed by the Bureau of Labor Statistics itself but which are placed by it in the group of food products. These include eggs, beans, milk, rice, onions, and potatoes,—wholly unmanufactured products of strictly farm origin,—and also butter, cheese, prunes, currants, and raisins, which, though in a sense manufactured articles, have been subjected to but slight change and that often on the farm itself. Most of the articles classed as farm products in this table are used directly or indirectly as human food, but a few, such as cotton, hides, and hay, are used for clothing or other purposes.

The remaining articles classed by the Bureau of Labor Statistics as food products have been divided into two groups:

the first includes manufactured articles derived from the products of domestic agriculture, such as flour, bread, meat; the second includes fish, mineral food substances, and imported food products,—sugar, tea, coffee, cocoa, spices, etc.

AVERAGE INDEX NUMBERS FOR 1912–13; AVERAGE PRICES OF 1890–99 EQUAL 100.

Group.	Index.
Farm products, raw or very slightly manufactured	158
Manufactured foods from domestic farm products	142
Other foods (mineral, fish, or imported)	101
Cloths and clothing	120
Fuel and lighting	139
Metals and metal products	113
Lumber and building materials	149
Drugs and chemicals	111
House furnishing goods	90
Miscellaneous	118
All commodities	137

This table shows a far greater price advance for domestic farm products than for most other classes of commodities. Their average price for 1912 and 1913 was 58 per cent. higher than the average for 1890–1899. For manufactured foods derived from domestic farm products, the increase was 42 per cent. As might be expected from the rapid exhaustion of our aboriginal forests, the increase for the group of lumber and building materials approaches that for farm products.

Confirmation of this great advance in the prices of farm products in the United States is afforded by the Census of 1910. According to the reports of the farmers themselves, the average increase in the prices of their crops, duly weighted, was no less than 66 per cent. between 1899 and 1909.

A comparison of the movement of wages with that of retail prices of food yields similar results. Such a comparison can be made only with difficulty; but Dr. I. M. Rubinow, in a recent careful analysis of the data of the Bureau of Labor Statistics, has reached the conclusion that in the short period from 1907 to 1912 the purchasing power of an hour's wages, expressed in cost of foods, decreased about 10 per cent., and

that for a considerable number of years before 1907 there had been no advance in such purchasing power.*

The extraordinary advance in the prices of farm products has naturally caused a still greater advance in the price of land itself. Anticipating still further increases in earning capacity, holders of land have marked up its price by leaps and bounds. From 1900 to 1910 the average value of farm land per acre in the United States as a whole advanced by no less than 108 per cent. In some of the best agricultural states like Illinois and Iowa, farm land values rose even more rapidly.

No doubt to use the extraordinary relative advance in prices of agricultural products and of land in the United States since the nineties as a measure of the increase in pressure of population on agricultural resources in the area of European settlement generally, would involve exaggeration. The middle nineties were years of abnormally low prices for farm products in this country. The imperfect data available for European countries show much less disparity in movement between the prices of agricultural and those of other commodities than the data for the United States. However, the prices of farm products in this country in recent years are not merely higher than during the nineties; they are the highest—reckoned in gold—ever known. Moreover, whatever may have been the movement of prices elsewhere and whatever the increase in the production of agricultural staples in the world as a whole, the filling up of the lands of the United States and the rapid advance in prices of agricultural products here can scarcely fail to indicate the near approach of a time when, for the world in general, pressure of population on agricultural resources can no longer find ready relief in geographical expansion. The United States represents a large fraction of the temperate zone and conditions here cannot but reflect themselves elsewhere.

Thus far, in discussing the future geographical expansion of agriculture, reference has been made only to the temperate zone. While a considerable part of the tropical zone is desert,

*Since this address was delivered, Prof. H. P. Fairchild has shown with a considerable degree of conclusiveness that the purchasing power of wages in this country was no higher in 1908 than in 1890.

there are large areas which are fertile and capable of great agricultural production. Tropical Asia and Oceania are densely peopled,—so densely, in fact, that they have often suffered from famine,—but the tropical regions of America and Africa are sparsely settled. The question arises, therefore, whether a large further expansion of the white population of the world may not find its food supply in these regions.

It is a well known fact that hitherto the white race has found the climate of the tropics an all but complete bar to permanent residence. The inhabitants of the tropics consist almost exclusively of colored races or of persons of mixed blood. Save only in Asia and some of the adjacent islands, these colored inhabitants of the tropics have, whether by reason of the depressing influence of the climate or otherwise, failed to develop much efficiency or to subdue in any appreciable degree the exuberant forces of nature.

It is conceivable that scientific progress and large investment of capital may enable the white race so to modify conditions in the tropics as to permit its members to dwell there in large numbers. The clearing of forests and the drainage of lands would much mitigate the injurious effect of the tropic heat. Could a large population of intelligent people maintain its efficiency in the now thinly settled tropics, it could unquestionably make them produce abundantly. At the same time, it must be recognized that the difficulties are great and that, at least for a long time to come, the prospects of such white settlement of the tropics are scarcely promising.

It has been suggested by some that the solution of the problem of utilizing the fertile tropics is to be found in developing there a large colored population under the direction and supervision of the whites. The success of the Dutch in the management of Java is often cited as an evidence of the possibilities of large production through colored labor in the tropics generally. In order that such a colored population should work assiduously and produce a surplus for exportation to the temperate zone, something more or less approaching slavery would apparently be necessary. Labor in Java is virtually compulsory, though of course it is free from the abuses of complete enslavement. The white race can scarcely look

forward with entire satisfaction to the prospect of having its increase in numbers depend upon the exploitation of colored peoples in the tropical zone.

We must conclude, then, that geographical expansion of agriculture in the future, whether in the temperate or the tropical regions of the earth, is likely to confront far greater difficulties than during the eighteenth and nineteenth centuries and that such difficulties will constantly become more serious.

It is urged, however, that scientific progress will permit a great increase in agricultural production and thereby furnish the means for a continuance of the growth of population. No doubt much is to be expected from scientific progress. It will help to render available lands which are now unsuited to efficient agriculture. It will do much to increase the yield per acre of lands already in use. Moreover, the improvement in productive processes in non-agricultural industries may, by setting free labor to turn to the soil, serve to increase the output of food.

But have we any right to assume that such progress will be sufficiently rapid to permit population to grow at the present rate and still advance its standard of living? Is it not usually the case that the earlier inventions and discoveries in science, art, and industry are relatively more important economically than the later? Can scientific seed selection and plant breeding, proper rotation of crops, efficient maintenance of soil fertility, or all the other improvements in agricultural methods which are now being studied and inculcated accomplish more for agriculture in a given length of time than did the introduction of horse drawn and automatic machinery for planting, cultivating, and harvesting crops during the nineteenth century?

We are sometimes misled into undue optimism as to the possibilities of agriculture by knowledge of the fact that in certain parts of the world enormously greater yields per acre are obtained than is the case elsewhere. We know, for instance, that the yields of the standard grains are twice as high in western Europe as in the United States or Canada or Argentina. We know that in China and Japan the cultivation of a single

acre often supports a family. We are too likely to overlook the fact that a large part of the excess in productivity is due to greater application of labor and only a much smaller part, if any, to superior methods. The output of each tiller of the soil is usually less in regions where the production per acre is high than where it is low. Intensive agriculture constantly bumps up against the law of decreasing returns.

It may be, of course, that the improvement in methods of production will be not slower but faster in the future than in the past. We have, however, no right to assume that such will be the case. A nation, like an individual family, is rash which multiplies its numbers in the blind confidence that "the Lord will provide." It is easily possible for population to outstrip agricultural production. Should the area of European settlement ever become as densely inhabited as China or India, it could hardly fail to mean a much lower standard of living than we now enjoy.

If a continuance of the present rate of population growth of the European stock as a whole portends the possibility of lower living standards, how much more must this be true of countries already so densely populated that they must rely on other lands for much of the necessaries of life? Several European countries have reached this stage. Further growth in their population with maintenance of present living standards is possible only by increasing dependence on imported foods and raw materials.

A large part of the enormous increase in international trade in recent decades has been due to the exchange of manufactured products of such countries for the raw products of less densely settled regions. The great economic problem of England, Germany, Belgium, and even France is usually expressed as the problem of finding markets for their surplus manufactures. This is but a euphemistic manner of saying that their problem is to find outside sources of food and other essentials. The search for those to whom to sell is really the search for those from whom to buy.

If present rates of population growth continue, other countries must one by one be added to the ranks of those dependent on outside sources for necessaries of life. This process of

building up population on the strength of resources somewhere else cannot go on forever. When enough nations have come to rely on the outside world for means of subsistence, there will be no outside world. There is danger that the end of the rope may be reached with a certain degree of suddenness.

From what lands can any great increase in supplies of food and other necessaries for the leading manufacturing countries be expected? Certainly not from the already overcrowded countries like India or China. For some time to come the more thinly settled regions, despite the handicaps under which most of them suffer, will doubtless have increasing surpluses of agricultural products to export. But these regions are rapidly filling up. Sooner or later they will require most if not all of their agricultural products to support their own population. Increasingly, moreover, they will come to manufacture their own more advanced commodities and there will be a consequent reduction in the demand for imports of manufactured articles. Indeed, the capitalists of the great industrial nations are themselves hastening the extinction of export markets by investing capital in factories and other industrial enterprises in the more thinly settled countries as well as in countries like China and India. Some day the great manufacturing countries are likely to be thrown back upon their own agricultural resources—resources which could not even support their present population without a serious decline in the standard of living.

The increasing dependence of certain nations on outside sources of food and other necessaries is a fertile seed of international discord. It is largely because of such dependence that England and Germany are today grappling in desperate conflict. A nation that is primarily devoted to manufactures and that can maintain its standard of living only by exporting them largely in exchange for food and materials naturally seeks to secure to itself exclusive sources of supply or, in the more common phrase, exclusive markets for its products. It looks with jealousy and fear upon the growth of the trade of another industrial nation with such sources of supply. Pressure of population in a crowded nation results in constant and strenuous efforts to control markets. It is all but inevitable

that this industrial and commercial struggle should ultimately result in war.

Nations which find themselves dependent on outside sources for necessaries of life are naturally disposed toward great armaments. The navy of England, the army of Germany, represent the effort to protect their sources of supply. They result from the desire to permit a steady increase in population without a fall in the standard of living. Indeed, there is a vicious circle in the policy of these nations. Germany, for example, wishes greater population that she may have more soldiers; she wishes more soldiers that she may expand her foreign trade and her territory; she wishes more foreign trade and more territory to support an increasing population. The sphere of woman, says the German Kaiser, is expressed in the four K's,—*Küche, Kleider, Kirche,* and *Kinder,*—with emphasis on the *Kinder.*

In the dependence of England and Germany on the outside world lies, too, the explanation of those violations of previously established principles of international law which have aroused such bitter complaint from our own country and other neutrals in the present war. In days when each belligerent was able to provide itself from within with food and necessaries of civilian life, it was natural that the list of contraband should be confined essentially to articles designed primarily for military use. No important effect on the results of the war could be secured by a wider extension of the list of contraband. Now conditions have so changed that to shut off sources of supply for an entire population may mean victory over the enemy. Under these circumstances belligerents can scarcely be expected to refrain from seeking that object or from adopting hitherto unaccustomed and unsanctioned means to accomplish it. The old rules of international law are hardly likely to be obeyed when the whole economic situation of belligerents is new.

The United States is already approaching the gateway of the path which England and Germany are treading. She is becoming primarily a manufacturing nation.

The great decline in our exports of agricultural products and the great increase in our exports of manufactures are

striking evidences of the change that is going on. Prior to 1900 we had been exporting over one third of our wheat crop. For the three years ending 1912, the proportion was less than one eighth. American fresh beef, which had furnished a large fraction of the consumption of the United Kingdom at the beginning of the present century, wholly disappeared from foreign markets only a decade later. The exportation of cured meats fell off greatly. In the last two or three years the United States has itself been importing considerable quantities of fresh meat from Argentina. It is true that during 1914 and 1915 exceptionally favorable weather conditions resulted in very large grain crops in this country and that our exports of agricultural products, stimulated by the unusual demand, have again increased greatly. There is, however, no reason to suppose that this condition will continue.

Meantime our rapidly increasing population has devoted itself more and more to elaborative industries. Our exports of manufactures have increased by leaps and bounds. Most Americans boast of these changes. The American politician has become accustomed to gauge the progress of the nation by the growth of manufactures and of exports of manufactures. Up to a certain point it was in fact an advantage to our country to develop in this direction. So long as growth in manufactures served to free us from dependence on older nations for the more advanced commodities, so long as it served to increase the variety and raise the quality of articles of consumption, it was most beneficial. So long as expansion in export trade served to bring us a greater range of imports and to place at our service things which our own land is incapable of producing, that expansion was advantageous.

But that which is up to a certain limit a gain may become an injury when once the limit is passed. We are rapidly approaching the time when we shall find it necessary to export manufactured commodities in order to supply ourselves with those very essentials of life which we have been accustomed to produce in abundance. If population in the United States continues to increase at the present rate and continues, as at present, to devote itself more and more to manufacturing industries, we shall soon become dependent on the outside

world in the sense in which England and Germany are dependent. We shall be threatened as they are threatened with a decline in the standard of living due to the possibility, if not the probability, of the drying up of outside sources of supply. We shall be drawn into trade conflicts which will threaten our peace. We shall feel forced to maintain great armaments.

Our statesmen are already turning their attention toward policies which indicate a sense of impending pressure of population on agricultural resources. They are beginning to talk of the necessity of finding wider markets for our manufactured products if labor is to be kept steadily employed. We are urged to take advantage of the disturbance of the foreign trade of the warring nations to strengthen our grip on the markets of South America, of Africa, of Asia. Various measures of governmental aid in the extension of markets and in the transportation of products to them have been taken or are now under consideration. It is being urged that combinations and trusts which in internal business would be unlawful should be permitted and even fostered for export business.

I am not quarreling with any of these policies. I am merely urging that we give serious consideration to the conditions and tendencies which lie back of them. If we cannot change the direction in which we are going, we should at least know what that direction is. We should not pride ourselves in pursuing a path which leads into danger.

The disastrous effects of overcrowding of population are not likely, under the institutions and laws existing in our country and in most other countries of European settlement, to be equally felt by all classes in the community. On the contrary, as long as natural resources are allowed to remain without restriction in private ownership, growth of population tends greatly to increase the disparity of wealth. It plays into the hands of owners of land and other natural resources. It is those that have no share in the ownership of resources whose standard of living is threatened. It is a familiar truism that increase of population creates economic rent, monopoly value, unearned increment.

In the early days of the single tax agitation in the United States stress was laid chiefly upon the injustice of leaving in

private hands the unearned increment of urban land, of mineral land, of water power, of railroads, and of similar forms of property. It was maintained that the greater part of the value of agricultural land, at least in the United States and countries of similar character, was not inherent in the land itself, but was a creation of the labor and capital of the farmers which should, according to these exponents of the doctrine, be free from taxation. Within the last decade or two this situation has changed. Economic rent for farm land in huge amount has emerged in the United States. A new agricultural problem has arisen as the direct result of growth of population. Reference has already been made to the extraordinary increase in land values in the United States in recent years. Without increasing in any way his labor or his investment of capital, without adding in the slightest to the quantity of products raised, the owner of farm land in the better agricultural sections might see his income rise immensely by reason of the advance in the prices of agricultural products.

Fortunately in this country the great bulk of the agricultural land is held by relatively small owners and five eighths of it by those who actually till the soil. The enormous unearned increment of land value has thus been widely distributed. Yet to the still more numerous landless class it is no great comfort that several millions have shared in that increment.

A certain amount of the increment of land value may properly enough in a new country be allowed to go to the pioneers and their immediate offspring. It is a fitting reward for initiative, compensation for hardship, stimulus to development. But in many parts of the United States the time has already arrived when justice to the landless classes demands that a large part of any future increment in the value of farm land should, by taxation or otherwise, be taken for general public use. Confiscation of values already existing would doubtless cause undue hardship and be unjust to recent purchasers, but further increments in the value of already valuable lands should no longer go to any single class.

A result of the unearned increment of farm land in the United States is that a rapidly increasing proportion of the

land is no longer cultivated by owners. Tenancy has assumed large proportions and is steadily advancing. So long as farm land commanded but little economic rent the owner, unless his tract was decidedly large, had to contribute his own management and physical labor to obtain a living from it. Today in many cases he can afford to live in idleness, to reap what others sow and tend.

The figures as to tenancy are familiar enough. In the United States as a whole 26 per cent. of the farms were operated by tenants in 1880, 28 per cent. in 1890, 35 per cent. in 1900, and 37 per cent. in 1910. Even more significant, however, are the data for the northern sections of the country. The problem of tenancy in the South, profoundly serious as it is, is in part a relic of slavery days. In the East North Central division, the proportion of tenant farms increased from 20 per cent. in 1880 to 27 per cent. in 1910; in the West North Central, from 20 per cent. to 31 per cent. These are our best agricultural sections. In Illinois and Iowa, the banner farming states, tenants in 1910 formed 41 and 38 per cent., respectively, of the farm operators. In one Illinois county out of five more than half of the farms are tenant farms.

While in a good many cases present farm tenants are sons or sons-in-law of retired farm owners and may themselves later become owners, nevertheless a distinct tenant class is rapidly developing. The tenancy problem is essentially the result of population growth.

It is in no small measure the increase of tenancy that has given rise to the present agitation for better facilities of rural credit. Except in newer and poorer agricultural sections, farm owners already enjoy reasonably satisfactory conditions of credit. They can borrow all they want at fairly moderate interest rates. It is very commonly stated that the real problem in the better agricultural sections is to devise means by which the tenant, the hired farm laborer, the immigrant, or the city dweller can obtain enough credit, at sufficiently low rates, to enable him to acquire and equip land.

Unfortunately in large parts of our country no such means can be devised, for the problem is only half a credit problem. The most ideal credit facilities would not alone suffice to

enable the landless to buy high grade land. The price of the land is too high and will remain too high so long as the unearned increment goes to the owner. Anticipating further advance in the price of farm products, the owner of agricultural land holds it at a figure such that its present output at present prices must necessarily be insufficient to give living wages to the farm operator and a normal rate of interest on the value of the land. It is very generally the case that the present earning capacity of the higher priced lands is only 2 or 3 per cent. of the value at which they are held. The farm owner capitalizes the present earning capacity at say 5 or 6 per cent. and then doubles the capitalization in anticipation of future advance in earning capacity. The poor man cannot afford to be a land speculator. He cannot buy and wait for an advance in earning capacity. He must pay interest on the cost of his land out of current earnings. Better credit facilities alone would do little to help him.

In fact a probable result of a material reduction in interest rates on land loans would be further to advance the price of farm land. Owners would very likely capitalize earning capacity on the basis of the lower rate. The landless man would therefore be substantially in the same position as before. It was not without reason that the National Conference on Rural Credit held at Chicago in December, 1915, included in its resolutions a recommendation that, in connection with any new system of rural credit, steps should be taken to prevent it from causing further advance in land values and inuring to the benefit of land speculators.

Unless we properly attack the problem of unearned increment a further increase in farm tenancy in the United States is bound to occur. Not only so but it is highly probable that the ownership of farm land will become increasingly concentrated and the economic rent more and more go to limited numbers of persons. It has ever been the case that monopoly values tend to be absorbed by the relatively few. When our multimillionaires come to realize the possibilities of unearned gain through farm land ownership, they will more and more seek control over such land, and their enormous resources will enable them to acquire wide reaching control.

Only passing reference may be made to the effects of increase of population in creating other forms of unearned increment. In the last decade or two there has been in the United States an immense addition to the value of urban land; of deposits of iron ore, anthracite coal, the better grades of bituminous coal, petroleum, copper, and other minerals; of water powers, forests, and similar limited natural resources. The great bulk of this unearned increment of value has been permitted to remain in private hands, and unfortunately in a very much smaller number of hands than in the case of farm land. Further additions to the value of these resources are bound to occur with further growth of population.

In the case of railroads and to some extent in the case of other public service enterprises, public regulation has checked materially the unearned increment due to population growth or, to put it more accurately, has taken that unearned increment in whole or in part for the public generally. Charges have been reduced or have been prevented from advancing in proportion to increase in operating expenses due to the generally higher level of prices and wages. Had there been no such rise in operating expenses, the railroads, for example, would, on the basis of an unchanged level of rates, have seen their profits enormously swelled during the past 15 or 20 years. The volume of traffic has grown very much more rapidly than the additions to investment. The more or less accidental fact of general advance in the level of prices and wages has enabled the people to absorb the unearned increment of the railroad business merely by holding rates substantially to the previous level.

It seems to me of fundamental importance that we in the United States should radically change our attitude toward growth of population. So long as we had vast resources scarcely scratched, rapid growth in population was eminently desirable. The scattered settlers in a new and rich country find their well-being distinctly promoted by the growth of numbers. But the pride in population growth and the desire for it engendered by such primitive conditions tend to persist after the conditions have utterly changed, and undoubtedly exercise a considerable influence in actually stimulating in-

crease in population. Further growth at the present rate threatens to lower our standard of living, to increase our dependence on other lands, and to widen the already perilously wide gulf between rich and poor.

The rate of growth of population tends to adjust itself to resources. Where population is already overcrowded and the standard of living low, famine and disease must increase. In a population with a high standard of living a voluntary restriction of the birth rate tends to take place whenever pressure on resources is felt. Indeed, such restriction of birth rate may be practiced with deliberate intent actually to raise the standard of living.

In this country this salutary tendency is, unfortunately, checked in some measure by that unreasoning pride in population growth to which reference has been made. Too often, moreover, both here and elsewhere, it is opposed by rulers and by leaders of thought and sentiment. The underlying motive of those who favor a high birth rate is usually the desire to increase military strength. Sometimes it finds support on supposed religious or ethical grounds. Sometimes the propaganda for a high birth rate is directed only to the middle and upper classes, who do, in fact, too often restrict their numbers unduly. The trouble is that those for whom the incitement to multiply is not intended are more apt to be influenced than those at whom it is aimed. Indeed, the danger of undue population growth lies largely in lack of prudence in respect to birth rate on the part of the poorer and less intelligent classes in the community. The effect of a high birth rate among such classes in increasing population is less subject to check by a high death rate in advanced countries than in semi-civilized countries. Our modern feeling of sympathy and our public and private donations for relieving distress protect the less prudent against the consequences of their multiplication in numbers.

In our own country the natural growth of population is greatly augmented by immigration. Had there been no immigration from 1900 to 1910 our population would have increased about 14 per cent. As it was, it increased 21 per cent. Immigration accounted for one third of the addition to our

numbers. Moreover, of the natural increase in the population a disproportionate share was attributable to the presence of the foreign born, of earlier migration. With their lower standard of living they have larger families than the older native stock.

If the admission of multitudes of foreigners to our shores served to relieve the pressure of population in the countries whence they came, we might at least congratulate ourselves upon a philanthropic action in opening wide our doors. As a matter of fact, it seems likely that the possibility of sending surplus population elsewhere tends to stimulate the birth rate in those countries. The policy of the United States and of various other nations in failing to restrict immigration, or even encouraging it, probably increases the rate of population growth in the world as a whole. However that may be, it is hard to be patient with those who believe that further large immigration will be beneficial to our own country. We no longer have a great over-plus of unused resources clamoring for development. It is principally into the manufacturing industries that present day immigrants are entering. Hardly an eighth of the foreign born added to our population during the last census decade went upon the land; the great bulk of them crowded into our cities. The flood of immigration is simply hastening the time when we shall become dependent on the outside world for the very means of subsistence, when our standard of living will fall, when we shall be forceed into militarism, when the masses of our people will be virtually the serfs of the few owners of natural resources.

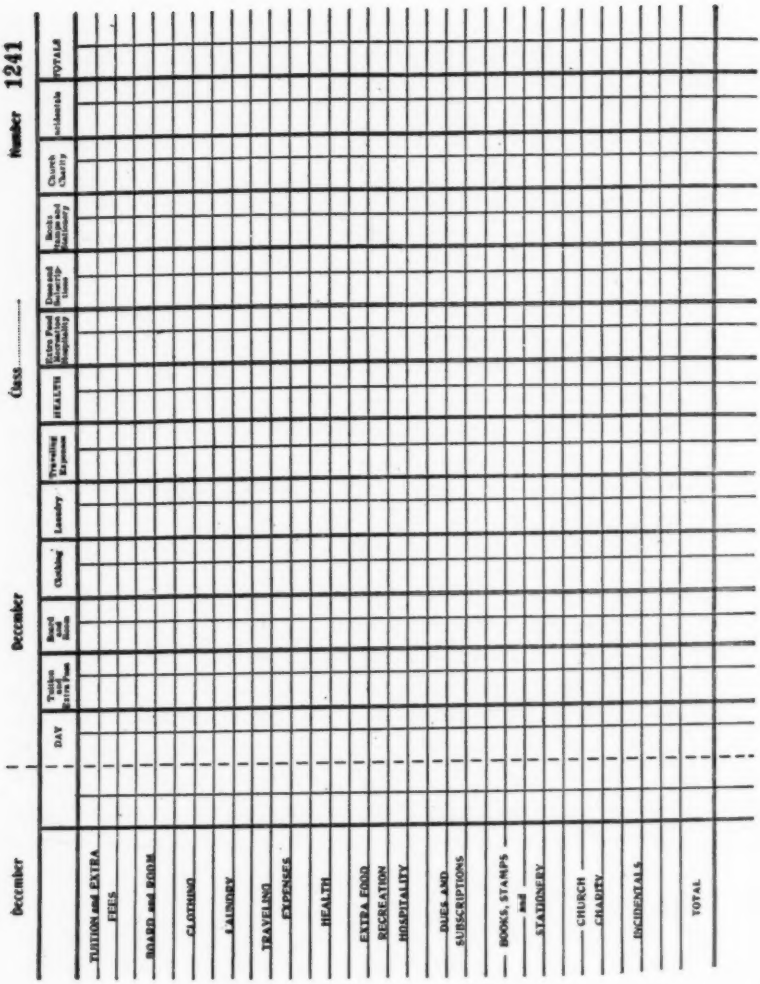
THE BUDGETS OF SMITH COLLEGE GIRLS.

By F. Stuart Chapin,, Ph.D., *Associate Professor of Sociology, Smith College.*

During the academic year, September to June, 1914 to 1915, all students in Smith College were asked to keep expense accounts. The keeping of these records was entirely optional with the individual, and some 1,341 girls, out of a student body of 1,638, volunteered. About 900 accounts were discontinued in the course of the year, so that only 421 complete and accurate accounts were made the subject of analysis.

A committee of three, representing the administration, faculty, and student organizations, drew up the plan of procedure. It was decided to furnish each student with a standardized account book in the form of monthly sheets, providing for daily entries, attached to a stub. At the end of every month, the sheets with their daily entries complete, were turned in at the office of the Dean. The records were called in every month, since a shorter interval would have discouraged the students by making the work burdensome, and a longer interval endangered the accuracy of the recorded items. For similar reasons the expenditure categories were limited to the following eleven: tuition and extra fees; board and room; clothing; laundry; traveling expenses; health; extra food, recreation, and hospitality; dues and subscriptions; books, stamps, and stationery; church and charity; and incidentals.

The accounts were strictly confidential. Personal privacy was guaranteed by the following plan of administration: the student presidents of every college house distributed the books in September, and each month reminded the students of their share in the investigation; at the end of the month each student tore off the completed sheet and turned it in; since each account book and every one of its sheets bore the same number, the final assembling of the nine sheets of any one book was not a difficult matter. The stub, with its monthly totals, was retained by the student.



When the books were all in and assembled, every book was individually examined and carefully cross checked by an adding machine. The whole mass of accounts and all parts of the subsequent analyses were twice checked, each time by a different person. Innumerable minor errors in the student's addition were found to be compensating, but there were two constant sources of error which appeared in many of the books —failure to enter the second payments for board and room,

and for tuition. This necessitated the careful examination and perusal of every book and the addition of the omitted entry wherever it was fully justified. Since the object of the investigation was to determine the cost of the college year for the "average" student, additions had to be made to the accounts of scholarship students, to make up for the reduced entry for tuition caused by the stipend.

The representativeness of the 421 complete accounts was checked in four ways:

1. By determining the number of accounts from each academic class, and the percentage it bore to the total registration of that class. For example—there were 97 Freshmen accounts, or 16.7 per cent. of the class; 102 Sophomores, or 28.7 per cent. of the class; 138 Juniors, or 27.4 per cent. of the class; and 82 Seniors, or 26.7 per cent. of the class.

2. By determining the percentage of books from different types of dormitories. For example, it was found that representative large and small "Campus Houses" turned in complete, 50 per cent. and over of the books originally taken out.

3. A comparison of the total expenditures for the normal months of November and February from the 421 complete accounts, with similar totals obtained from all incomplete accounts. This comparison showed that the 421 complete accounts averaged $3.00 less than the incomplete accounts.

4. A comparison of the average expenditures of the 421 books, with the itemized expenditures of certain individual accounts, of students and alumnae, known to be accurate. (Comstock, A. L.—Undergraduate Budgets, *Smith Alumnae Quarterly*, Vol. VII, No. 2, pp. 84–86.)

These checks indicate that the completed accounts are fairly representative of budgets of the student body.

A total of $322,297.42 was expended by these 421 students during the academic year 1914–1915. The mean budget was, therefore, $765.55. Since this average tends to mask significant differences in expenditure which occur among different income groups, the individual totals are arranged by $50.00 class intervals in the following table:

TABLE I.

Total Expenditure.	No. Students.	Total Expenditure.	No. Students.
$350 to 400	4	$1,100 to 1,150	10
400 " 450	15	1,150 " 1,200	6
450 " 500	21	1,200 " 1,250	6
500 " 550	26	1,250 " 1,300	4
550 " 600	39	1,300 " 1,350	4
600 " 650	46	1,350 " 1,400	3
650 " 700	52	1,400 " 1,450	3
700 " 750	32	1,450 " 1,500	1
750 " 800	34	1,500 " 1,550	1
800 " 850	34	1,550 " 1,600	..
850 " 900	24	1,600 " 1,650	2
900 " 950	17	1,650 " 1,700	1
950 " 1,000	14	1,700 " 1,750	..
1,000 " 1,050	11	1,750 " 1,800	..
1,050 " 1,100	8	1,800 " 1,850	3
			421

Computing the modal average and the median from this table (King, W. I.,—Elements of Statistical Method, 1912, pp. 124, 129), the modal expenditure is found to be $670.51 the median $711.72, both considerably smaller accounts than the mean. The most representative average, however, is probably the mean, since our sample 421 accounts are undoubtedly drawn more largely from the economical and systematic students than from the extravagant classes. The skewing of the distribution over towards the lower income groups would appear to be an indication of this.

The mean expenditure for different items follows:

TABLE II.

Clothing	$76.27	Recreation	$35.09
Laundry	8.50	Dues and subscriptions	10.30
Travel	58.57	Books, stamps, stationery	26.08
Health	11.74	Church and charity	5.24
Incidentals	43.19		

But Table II has the disadvantage of masking significant differences found among different income classes. Table III throws considerable light upon the actual cost of different items and the proportion of total income expended for them.

TABLE III.

ITEMIZED EXPENDITURE BY INCOME CLASSES.(a)

Items.	$350–$600 Low.		$600–$800 Medium.		$800–$1,000 Liberal.		$1,000–$1,900 Very Liberal.	
	Average.	Per Cent.	Average.	Per Cent.	Average.	Per Cent.	Average.	Per Cent.
Board and room (b)	$251.00	48.6	$311.00	45.0	$362.00	41.2	$448.48	36.8
Clothing	11.09	2.1	46.17	6.6	90.62	10.3	216.67	17.7
Laundry (c)	1.61	.3	6.69	.9	10.82	1.2	19.23	1.5
Travel (d)	22.75	4.4	40.56	5.8	78.81	8.8	135.85	11.1
Health	5.47	1.0	10.35	1.5	14.95	1.7	19.38	1.5
Recreation	15.32	2.9	32.64	4.7	42.90	4.8	63.17	5.1
Dues and subscriptions	6.61	1.2	9.95	1.4	11.52	1.3	17.48	1.4
Books, stamps, stationery	16.73	3.2	25.27	3.6	30.28	3.6	27.98	3.1
Church and charity	2.69	.5	4.81	.6	6.01	.6	9.60	.7
Incidentals	19.36	3.7	36.22	5.2	58.28	6.6	81.15	6.6
Totals	$513.28		$689.66		$878.58		$1,218.60	
No. students per class	100		145		81		58	

(a) The table is based on 384 account books. Out of the 421 complete books, 37 had to be excluded in the computation of average expenditure for items because of blanket monthly totals. These totals were apparently accurate when checked with totals from itemized books, but as there was no way to distribute them among the items, the books had to be thrown out in computing the average itemized expenditures.

(b) Board and room is at the flat rate of $300.00 for the academic year in all campus houses, with the exception of Tenny and Lawrence House. In the latter houses, the charge is $200.00 and less. In the larger houses there are a few expensive suites which rent at from $400.00 to $500.00 for board and room. The charge for tuition is $150.00 for the academic year. But with extra fees added, tuition averages about $165.00. Grand totals at foot include tuition and extra fees.

(c) The item for laundry is small because a certain amount of laundry work is included within the charge for board and room in regular college dormitories, and also because of the custom which exists among off-campus students of sending their laundry home.

(d) Traveling expenses include to and from college during the Christmas recess and the Spring recess, but exclude expenses during the summer vacation.

If we select the itemized expenditures of the medium budget group as representing the expenditure scheme of the "average" girl, interesting comparisons may be made with the three other groups.

The girls with low budgets spend less than one fourth as much money and less than one third the "average" proportion of their income for clothing and laundry. The other expenditures of this class, especially those for travel, recreation and incidentals, are less than the average. Necessities, board and room, tuition and extra fees, absorb a relatively larger percentage of their more limited incomes than is the case with other classes.

The two liberal groups spend an increasingly greater proportion of their incomes for clothing and travel. Aside from

the variation in proportion of income expended for travel, clothing is the item most reduced by the economy of the low budget group and most increased by the extravagance of the liberal groups. The actual figures show that 99 low budget girls spent a total of $2,207.27 for clothing, as compared with $6,603.20 by 143 medium budget girls, $7,339.88 by 81 liberal budget girls, and $12,566.60 by 58 very liberal budget girls.

In connection with the expense schedule of the low budget group, it is interesting to examine the expenditures of 30 girls in Tenney and Lawrence Houses, college dormitories. At Tenney House, a girl may lodge for from $35.00 to $70.00 a year. At Lawrence House, where each girl takes care of her own room and gives approximately one hour a day to the work of the house, a total charge for board and room is $200.00. Lawrence House is a successful experiment in coöperative housekeeping.

TABLE IV.

ITEMIZED EXPENDITURE OF 30 GIRLS IN TENNEY AND LAWRENCE HOUSES.

Items.	Average Expenditure.	Per Cent. of Total.	Range.
Board and room	$180.75	37.0	$103.30–$263.00
Clothing	27.45	5.7	5.22– 101.80
Laundry	1.86	.3	.00– 4.61
Travel	23.35	4.9	1.06– 69.28
Health	8.89	1.8	.00– 66.91
Recreation	17.23	3.6	7.08– 71.52
Dues and subscriptions	7.78	1.6	1.89– 16.77
Books, stamps, stationery	19.32	4.0	5.47– 42.51
Church and charity	3.48	.7	.60– 14.90
Incidentals	20.04	4.2	1.24– 46.26
Totals	$476.51	63.8(a)	$377.27–$609.83

(a) excludes tuition and extra fees.

On the whole, these 30 girls appear to live rather better than the 99 girls of the low budget group of Table II. Since they save, on the average, about $70.00 a year on board and room, they are able to spend in spite of their smaller incomes a greater amount of money on every item in the list than are the girls of the low budget group. It is quite evident, therefore, that these low priced college dormitories abundantly justify their existence and are of great benefit to the girl of very moderate income.

A classification of mean expenditures of the entire group of students on the basis of necessities, pleasure and books, as adopted by Professor William B. Bailey ("Personal Budgets of Unmarried Persons," *Yale Review*, Vol. X, pp. 70–83), shows 87.4 per cent. for necessities, 8.2 per cent. for pleasure, and 4.2 per cent. for books.

TABLE V.

I. Necessities	87.4	II. Pleasure	8.2
Board and room	55.0	Dues	1.6
Clothing	12.4	Church and charity	.8
Laundry	1.3	III. Books, stamps, and stationery	4.2
Travel	9.5		
Health	1.9		
Incidentals	7.0		

(Payment for tuition and extra fees excluded)

The stability of certain expenditures in proportion to income is an interesting contrast to the variation in other items. Thus an examination of Table III shows that the proportionate expenditure for health, dues and subscriptions, books and stationery, and for church and charity varies but little whatever the income. The proportionate expenditure for recreation and incidentals remains fairly constant for the three upper groups. It is apparent, therefore, that these items constitute a rather stable element in the standard of living of the group of college girls studied.

The significance of this fact is further brought out by Table VI, in which the items are arranged in order of their proportionate importance by the income classes of Table III.

TABLE VI.

EXPENDITURE ITEMS BY ORDER OF IMPORTANCE.

	Low $350–$600.	Medium $600–$800.	Liberal $800–$1,000.	Very Liberal $1,000–$1,900.
1.	Board and Room	Board and Room	Board and Room	Board and room
2.	Travel	Clothing	Clothing	Clothing
3.	Incidentals	Travel	Travel	Travel
4.	Books	Incidentals	Incidentals	Incidentals
5.	Recreation	Recreation	Recreation	Recreation
6.	Clothing	Books	Books	Books
7.	Dues	Health	Health	Health
8.	Health	Dues	Dues	Laundry
9.	Church and charity	Laundry	Laundry	Dues
10.	Laundry	Church and charity	Church and charity	Church and charity

The median item appears to be recreation and it holds fifth place in all classes. The three upper classes are in agreement for the first seven items and church and charity. This table indicates that the entire group is quite homogeneous.

The present study would be incomplete without some mention of its relation to the principles of Engel's law. Table VII is therefore presented to show the bearing of the Smith College figures upon this law. It will be observed that the trend of the figures in the table is in substantial agreement with the American experience of itemized expenditure by different income classes: the greater the income the smaller the percentage outlay for subsistence; the greater the income the larger the percentage expended for clothing; and the greater the income the larger the percentage expended for sundries (recreation and incidentals).

TABLE VII.

SMITH COLLEGE FIGURES BY ENGEL'S GROUPING.

Items. Per Cent.	Low $350–$600.	Medium $600–$800.	Liberal $800–$1,000.	Very Liberal $1,000–$1,900.
Board and room	48.6	45.0	41.2	36.8
Clothing	2.1	6.6	10.3	17.7
Sundries	6.6	9.9	11.4	11.7

A study of expenditure by academic classes, Seniors, Juniors, Sophomores, and Freshmen, shows that in the order named the percentage spent for room and board diminishes. Juniors show the largest total expenditure for the year and the largest percentage spent for clothing, laundry, and recreation (the Junior "Prom" causes the swelling of these items). Seniors spend the largest percentage of any class for books.

Considering the facts summarized in the foregoing tables, it appears that Smith College students, as measured by the sample 421 account books, are a homogeneous average group of American girls.

A COMPARISON OF THE RELATIVE HEALTHFULNESS OF CERTAIN CITIES IN THE UNITED STATES BASED UPON THE STUDY OF THEIR VITAL STATISTICS.

By G. E. Harmon, M.D., C.P.H., *Department of Hygiene, Western Reserve University.*

In making a comparison of the relative healthfulness of several cities, the whole picture of the sanitary conditions must be obtained; in other words, the problem must not be approached from a single viewpoint. Take, for example, two communities, one having a high typhoid rate and a low infant mortality rate, the other having a low typhoid rate and a high infant mortality rate; if either the typhoid or the infant mortality rate is taken as the only criterion, are we able definitely and impartially to decide which of the two is the more healthful? Decidedly not, for we have approached the problem from one point of view and have omitted the measurement of other factors which go to make up the total health of a community. It is necessary, therefore, to make use of indices measuring as many as possible of the factors going to make up the total picture of the health of the community.

This, of course, is somewhat idealistic, and for practical purposes is not possible except perhaps by the use of life tables, which probably furnish the best single measurement of the health of a community. Many health factors are taken into account in the construction of a life table. This method of comparison has the drawback that life tables require a great deal of time and technical knowledge for their construction. In this paper, accordingly, the ideal method of comparing communities by the use of life tables will not be employed, but a few of what would appear to be the most valuable of the other indices will be considered.

The following cities will be considered: Baltimore, Boston, Buffalo, Cincinnati, Cleveland, Denver, Los Angeles, Minneapolis, New York, Omaha, Pittsburgh, San Francisco, and St.

Louis. A period of 15 years, 1900 to 1914, will be covered, for it seems to be advisable to include a sufficient number of years to avoid the fluctuations in the yearly rates due to other causes than actual health work. Because of these little understood variations, it is hardly fair to judge a city by one year's experience. It is the steady general tendency in health conditions resulting from organized purposeful health work which we wish to measure, and this can best be done by studying the vital statistics for a number of years.

For the first 13 years considered, the material has been obtained from the annual Mortality Statistics published by the Bureau of the Census. The data used for obtaining the figures for the last two years were furnished me by the health officers of the various cities, or were obtained from the annual health reports of these cities. In one or two instances certain figures for 1913 were obtained from the mortality statistics for that year instead of the annual reports of health officers.

In calculating rates, midyear estimates of the population were used. Whenever it was found necessary to estimate the population, the arithmetical method was employed. The estimates of population for 1910, 1911, 1912, and 1913 were taken from Bulletin 122 of the Bureau of the Census. Of course these estimates for the last 4 years of the period under consideration may be too low or too high, but this cannot be determined until the next census is taken. Thus the rates for the last 4 years may be slightly inaccurate; in some cases the rates will be too low and in others, where the population has grown more rapidly than has been estimated, the rates will be too high. The probability is, however, that these errors are small and of but little consequence. Then, too, the rates used are as likely to be correct as any that can now be obtained. The calculations for this paper were made by the use of a slide rule, as this method was deemed to give sufficient accuracy.

The Crude Death Rate is frequently used as an index in judging the sanitary condition of a community. It is not an altogether accurate index, for it is influenced by or depends upon a number of factors which do not come within the con-

trol of health authorities and which may vary a great deal in two places. The age and sex distribution of the population are two important factors which greatly influence the crude death rate. As these factors have nothing to do with the healthfulness of a given place, an index which is influenced by them is not altogether satisfactory. The crude death rates, however, give some general indications which may be of value, and are probably a fairly accurate measure of the changes over a period of years in a given community, for here the factors of age and sex distribution do not vary much from year to year.

The following table gives the average crude death rate per 1,000 population for the entire period, the average rate for the first three and the last three years of the period, and the decrease or increase between these last average rates:

TABLE I.

CRUDE DEATH RATES FROM ALL CAUSES.

City.	Average Rate, 1900-1914.	Average Rate, 1900-1902.	Average Rate, 1912-1914.	Increase or Decrease.
Baltimore	19.3	20.4	18.0	−2.4
Boston	17.9	19.7	16.3	−3.5
Buffalo	15.5	14.9	15.4	+0.5
Cincinnati	18.7	18.6	16.5	−2.1
Cleveland	14.5	16.0	13.6	−2.4
Denver	16.6	18.5	13.7	−4.8
Los Angeles	15.5	17.0	14.2	−2.8
Minneapolis	10.8	11.0	11.3	+0.3
New Orleans	21.9	23.6	20.2	−3.4
New York	17.2	19.6	14.2	−5.4
Omaha	12.8	12.0	13.4	+1.4
Pittsburgh	18.3	19.9	16.2	−3.7
San Francisco	17.7	20.7	15.6	−5.1
St. Louis	16.3	17.8	15.0	−2.8

It is evident from a study of this table that the rates in nearly all the cities have decreased in the last 15 years. The decrease is especially large in the case of New York, Denver, and San Francisco. It will be observed that the rates have increased for Buffalo, Minneapolis, and Omaha. In the case of Buffalo, a city which is growing very rapidly, this is probably due to the fact that the estimates of the population are too low. The same reason may explain the increase in the rates of the other two cities, or the increase may be due to imperfect registration of deaths during the early part of the period being

considered, which would tend to make the rates for the early years too low and thus prevent the cities from showing a decrease.

In rating cities as to their relative healthfulness it would hardly be fair to arrange them according to the percentage of decrease in their death rates, for a city with a low rate to start with would not have a possibility of reducing it equal to that of the city which started with a high rate. Moreover, as we are especially interested in the conditions obtaining at the present time, the average rates for the entire period and for the first three years are not satisfactory for rating purposes. We, therefore, will take the average rates for the years 1912–1914 as the basis in comparing the cities. We assume that the lower this rate, the more healthful is the city. The order of the cities in regard to their healthfulness, beginning with the one having the lowest rate, would then be as follows:

(1) Minneapolis	11.3	(8) Buffalo	15.4
(2) Omaha	13.4	(9) San Francisco	15.6
(3) Cleveland	13.6	(10) Pittsburgh	16.2
(4) Denver	13.7	(11) Boston	16.3
(5) New York	14.2	(12) Cincinnati	16.5
(6) Los Angeles	14.2	(13) Baltimore	18.0
(7) St. Louis	15.0	(14) New Orleans	20.2

Standardized Death Rates. As has already been indicated, the crude death rate is markedly influenced by the age and sex distribution of the population. Since in the standardized death rates the variable factors of age and sex distribution have been eliminated, they should furnish a more reliable index of sanitary conditions in comparing communities than the crude death rates. The standardized rates presented in this paper were computed by the indirect method as described in the Seventy-fourth Annual Report of the Registrar General of Births, Deaths, and Marriages in England and Wales, 1911.

TABLE II.

STANDARDIZED DEATH RATES.

City.	Average Rate, 1900–1914.	Average Rate, 1900–1902.	Average Rate, 1912–1914.	Increase or Decrease.
Baltimore	20.6	21.8	19.2	−2.6
Boston	19.1	21.0	17.4	−3.6
Buffalo	17.1	16.4	17.0	+0.6
Cincinnati	20.3	20.2	17.9	−2.3
Cleveland	16.2	17.9	15.2	−2.7
Denver	18.8	21.0	15.6	−5.4
Los Angeles	16.3	17.9	15.0	−2.9
Minneapolis	12.5	12.7	13.1	+0.4
New Orleans	24.3	26.1	22.4	−3.7
New York	19.7	22.5	16.3	−6.2
Omaha	14.9	13.9	15.5	+1.6
Pittsburgh	20.7	22.5	18.3	−4.2
San Francisco	20.1	23.5	17.7	−5.8
St. Louis	18.4	20.1	17.0	−3.1

On the basis of the standardized rates for the period of 1912–1914, the cities now have the following order:

(1) Minneapolis	13.1	(8) Buffalo	17.0
(2) Los Angeles	15.0	(9) Boston	17.4
(3) Cleveland	15.2	(10) San Francisco	17.7
(4) Omaha	15.5	(11) Cincinnati	17.9
(5) Denver	15.6	(12) Pittsburgh	18.3
(6) New York	16.3	(13) Baltimore	19.2
(7) St. Louis	17.0	(14) New Orleans	22.4

It will be noticed that the order of the cities is not the same as in the previous rating based upon the crude death rates. Minneapolis and Cleveland retain the first and the third place respectively. Omaha has dropped from the second to the fourth place, and Los Angeles jumped from the fifth to the second.

Infant Mortality. The number of children dying under one year of age is frequently used as an index of the health of a community. This is not a complex index, because it measures only a few of the factors or conditions which require consideration, and the same can be said of all the other indices which will be taken up in this paper. Still the attitude taken by a community toward the health and care of infants indicates in a certain way the general attitude toward all health activities. A study, therefore, of the infant mortality, should give some indication, even if in a general way, of the healthfulness of a given place. A serious difficulty,

however, is experienced in calculating a rate for expressing the infant mortality which will be reliable for purposes of comparison. It is fairly well agreed that the infant mortality should be expressed as so many deaths per 1,000 living births. But as the registration of births in the United States is notoriously defective, any rates based upon this registration will of course be inaccurate and not of much service. Then, too, it would not be fair to compare, on this basis, cities which have complete registration of births with those which have not. Since some of the cities studied do not have complete registration of births, unless perhaps for the most recent years, this method of expressing the infant mortality could not be used.

Several other methods were tried. The infant mortality was expressed in the following ways: (1) per 1,000 of living population under one year of age; (2) per 1,000 of living population under 5 years of age; (3) as a percentage of the total number of deaths; and (4) per 100,000 total population. It is obvious that all these are likely to be unsatisfactory. In the first two methods, the populations used in calculating the rates except for censal years must be estimated and these estimates are very likely to be inaccurate. Then, too, even in census years, the actual enumeration of persons in the age group under one is not considered to be very accurate. As the enumeration of persons in the age group 1–5 is likely to be more accurate, the second method was tried, but it did not prove to be of much value. The third method is even worse than the other two, for it is a ratio between two variable factors and so does not give any reliable picture of the infant mortality. If, for instance, the deaths from causes other than infant mortality decreased and the deaths of infants remained the same, the percentage obtained would indicate that infant mortality had increased, while in reality it would have remained the same. The fourth method is influenced by variations in the composition of the population and, therefore, is not entirely reliable.

The infant mortality was calculated, however, by all these methods to see what information could be gained. The accuracy of these methods was then tested by comparing the

results obtained by expressing the infant mortality as so many deaths per 1,000 living births. It is assumed, of course, that this latter method is the most accurate, and so should be used as a standard. The Bureau of the Census, in Bulletin 112, 1911, indicated that 8 of the cities, Los Angeles, St. Louis, New York, Boston, Omaha, Cincinnati, Pittsburgh, and Buffalo, are considered to have fairly complete registration of births, so that a rate of infant mortality based on births would be approximately correct for these cities. Such a rate was taken for a given year and these cities arranged according to the magnitude of their infant mortality, beginning with the city having the lowest. The cities were then similarly arranged for the same year by using rates calculated by each of the 4 other methods. None of the 4 methods placed the cities in the same relative position as regards their infant mortality as that in which they were placed by the standard method. The following table may help to make these points clearer:

TABLE III.

INFANT MORTALITY RATES, 1910.

City.	Infant Deaths per 1,000 Births.	Rank.	Infant Deaths per 1,000 Population under 5.	Rank.	Infant Deaths per 100,000 Total Population	Rank.	Infant Deaths per 1,000 Population under 1.	Rank.	Per Cent. of Infant Deaths to Total Deaths.	Rank.
Los Angeles.....	97	1	22.9	1	164	1	110	1	11.7	1
St. Louis.....	115	2	28.0	2	244	3	136	2	15.6	3
New York.....	125	3	31.8	5	337	6	147	4	21.1	6
Boston.....	126	4	35.1	6	333	5	167	6	19.5	5
Omaha.....	126	5	28.2	3	237	2	140	3	15.7	4
Cincinnati.....	131	6	31.4	4	252	4	150	5	14.5	2
Pittsburgh.....	150	7	38.9	8	421	8	176	7	23.4	7
Buffalo.....	162	8	38.2	7	382	7	180	8	23.4	8

It will be seen that the methods of expressing the infant mortality other than by the relation of infant deaths to births are not satisfactory for purpose of comparison between places. In view of this the rates as calculated by the 4 other methods will not be used in this paper. It should be added, however, that the calculation showed, for practically every city, by each of the 4 methods, that the infant mortality has decreased, and in some cases to a large extent, during the period 1900–1914.

Typhoid Fever. The death rate from typhoid fever is generally thought to be a good sanitary index of a community. It is a valuable index because it is a disease which can and should be controlled, for the principles underlying its eradication are fairly well understood and are possible of application. The data regarding typhoid fever are presented in the following table:

TABLE IV.

TYPHOID FEVER DEATH RATES PER 100,000 POPULATION.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Decrease.
Baltimore	32.4	36.6	23.5	−13.1
Boston	16.7	23.6	8.4	−15.2
Buffalo	23.5	28.3	14.3	−14.0
Cincinnati	33.0	51.8	6.4	−45.4
Cleveland	28.1	41.9	9.8	−32.1
Denver	34.0	47.2	12.2	−35.0
Los Angeles	22.8	33.9	11.6	−22.3
Minneapolis	29.2	42.3	12.1	−30.2
New Orleans	34.4	48.9	17.5	−31.4
New York	14.2	20.4	7.6	−12.8
Omaha	24.8	23.3	9.0	−14.3
Pittsburgh	81.3	132.0	15.9	−116.1
San Francisco	23.8	28.1	14.4	−13.7
St. Louis	23.8	35.4	12.9	−22.5

Table IV plainly shows that for all the cities there has been a marked decrease in the amount of typhoid fever. Still the rates are much too high. Arranging the cities according to their typhoid rates for the period 1912–1914, we obtain the following relative standing:

(1) Cincinnati	6.4	(8) Denver	12.2
(2) New York	7.6	(9) St. Louis	12.9
(3) Boston	8.4	(10) Buffalo	14.3
(4) Omaha	9.0	(11) San Francisco	14.4
(5) Cleveland	9.8	(12) Pittsburgh	15.9
(6) Los Angeles	11.6	(13) New Orleans	17.5
(7) Minneapolis	12.1	(14) Baltimore	23.5

By this method of rating cities we should judge that Cincinnati was the most healthful, with New York second and Boston third. None of these cities, however, was in any of the first three positions when the rating was based upon the standardized death rates.

Tuberculosis. The death rate from tuberculosis is also a frequently used and valuable index in judging the sanitary

conditions of different places. The nature of the disease is fairly well understood. There are also certain procedures which are generally admitted to be efficacious in preventing the disease, and there are many organizations engaged in the work of prevention. The death rate from tuberculosis, therefore, is a valuable index of what a community is accomplishing along at least one line of health work as well as of its general healthfulness.

Only the pulmonary form of tuberculosis is considered, for this is the most common type of the disease and the one against which most of the preventive measures are directed. Pulmonary tuberculosis is also representative of the whole tuberculosis problem.

TABLE V.

PULMONARY TUBERCULOSIS DEATH RATES PER 100,000 POPULATION.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Increase or Decrease.
Baltimore	223	232	191	− 41
Boston	185	232	146	− 86
Buffalo	125	119	130	+ 11
Cincinnati	235	214	220	+ 6
Cleveland	120	116	113	− 3
Denver	334	375	246	−129
Los Angeles	275	328	227	−101
Minneapolis	113	118	115	− 3
New Orleans	282	323	249	− 74
New York	199	226	169	− 57
Omaha	101	97	93	− 4
Pittsburgh	120	128	101	− 27
San Francisco	214	284	166	−118
St. Louis	175	187	136	− 51

In studying this table it must be remembered that in some instances the registration of deaths was incomplete for the period 1900–1902, and so the rates are too low. This tends to make the apparent decrease in the rates too small and may even account for an increase. A possible underestimate of the populations for 1912–1914 would have a similar effect upon the amount of decrease or increase. In general the rates have shown a tendency to decrease for most of the cities, and they probably have actually decreased in every instance. The cities have the following relative standing when arranged according to their pulmonary tuberculosis rates for the period 1912–1914:

(1) Omaha	93	(8) San Francisco	166
(2) Pittsburgh	101	(9) New York	169
(3) Cleveland	113	(10) Baltimore	191
(4) Minneapolis	115	(11) Cincinnati	220
(5) Buffalo	130	(12) Los Angeles	227
(6) St. Louis	136	(13) Denver	246
(7) Boston	146	(14) New Orleans	249

It will be observed that the positions of the cities have again changed to a marked extent, and do not correspond with any of the previous ratings.

Death Rates for the Age Group 1–4. There are various agencies engaged in the prevention of infant mortality. When a child goes to school its health is again cared for by the various health activities of the school organization. There is the possibility, however, that the health of children in the age group 1–4 is not sufficiently cared for, as there seems to be a gap here in the health activities for such children. Thus the death rates for this group age may serve as a valuable index of the inherent healthfulness of a given place. In any event it measures one of the factors which go to make up the healthfulness of a community.

TABLE VI.

DEATH RATES PER 100,000 POPULATION, IN AGE GROUP 1-4.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Decrease.
Baltimore	156	185	122	– 63
Boston	153	213	111	–102
Buffalo	128	152	96	– 56
Cincinnati	123	161	81	– 80
Cleveland	129	155	114	– 41
Denver	84	117	52	– 65
Los Angeles	73	83	65	– 18
Minneapolis	73	93	64	– 29
New Orleans	136	174	104	– 74
New York	190	251	128	–123
Omaha	71	95	57	– 38
Pittsburgh	219	265	168	– 97
San Francisco	84	112	70	– 42
St. Louis	119	183	93	– 90

The question arose as to whether the rates should be expressed as so many deaths per 100,000 total population or per 1,000 under 5 years of age. The first method seemed preferable for the reasons previously noted. It must be remembered, however, that the age distribution of the population exerts

some influence on the rates when this method is followed, but the error from this cause is probably slight.

Table VI shows that for all the cities there has been a decrease in the death rates for the age group 1–4. Rating the cities according to this index, we obtain the following result:

(1) Denver	52	(8) Buffalo	96
(2) Omaha	57	(9) New Orleans	104
(3) Minneapolis	64	(10) Boston	111
(4) Los Angeles	65	(11) Cleveland	114
(5) San Francisco	70	(12) Baltimore	122
(6) Cincinnati	81	(13) New York	128
(7) St. Louis	93	(14) Pittsburgh	168

The relative positions of the cities are quite different from those shown in any of the other ratings.

Diarrhoea (Under 2). The death rate from diarrhoea under 2 years is frequently considered to be a good index of the sanitary conditions of a community, because it measures the care given children. The rates will be expressed as so many deaths per 100,000 total population. The following table presents the data relating to diarrhoea under two years of age:

TABLE VII.

DIARRHOEA (UNDER TWO) DEATH RATES PER 100,000 POPULATION.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Increase or Decrease.
Baltimore	119	143	95	−48
Boston	100	119	74	−45
Buffalo	125	114	125	+11
Cincinnati	76	72	62	−10
Cleveland	120	95	131	+36
Denver	44	51	21	−30
Los Angeles	35	35	33	− 2
Minneapolis	47	51	36	−15
New Orleans	117	111	90	−21
New York	125	156	72	−84
Omaha	45	48	25	−23
Pittsburgh	158	171	118	−53
San Francisco	48	57	36	−21
St. Louis	68	59	63	+ 4

This method places the cities in the following relative positions:

(1) Denver	21	(3) Los Angeles	33
(2) Omaha	25	(4) San Francisco	36

(5) Minneapolis	36	(10) New Orleans	90
(6) Cincinnati	62	(11) Baltimore	95
(7) St. Louis	63	(12) Pittsburgh	118
(8) New York	72	(13) Buffalo	125
(9) Boston	74	(14) Cleveland	135

It will be noted that this rating is quite different from that for typhoid fever. From this it is probably fair to presume that the conditions affecting the prevalence of typhoid fever are not the same as those for diarrhoea.

The diseases which remain to be considered belong in a somewhat different class from those already covered. There are certain methods which are well understood and which are generally admitted by all to be efficacious in preventing typhoid fever and tuberculosis. There seems, however, to be no unanimity in regard to the best methods for restricting or eliminating the following diseases, with the possible exception of diphtheria, and the methods which are used do not give especially satisfactory results.

TABLE VIII.

MEASLES DEATH RATES PER 100,000 TOTAL POPULATION

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Increase or Decrease.
Baltimore	8.0	5.4	7.6	+ 2.2
Boston	15.0	17.2	11.6	− 5.6
Buffalo	12.5	13.1	11.7	− 1.4
Cincinnati	11.6	12.2	8.5	− 3.7
Cleveland	8.2	3.6	8.7	+ 5.1
Denver	7.7	8.8	1.2	− 7.6
Los Angeles	5.2	3.8	4.9	+ 1.1
Minneapolis	5.0	1.6	3.9	+ 2.3
New Orleans	6.8	7.3	4.3	− 3.0
New York	15.7	16.2	12.2	− 4.0
Omaha	5.7	5.0	.2	− 4.8
Pittsburgh	25.5	32.6	21.2	−11.4
San Francisco	8.2	9.9	7.6	− 2.3
St. Louis	9.3	2.5	9.3	+ 6.8

Table VIII shows that deaths from measles are a very variable factor in judging the health conditions of a place. In some instances the rates have increased during the last 15 years, and in others they have decreased. A study of the measles rates gives the following relative positions to the cities:

(1) Omaha	.2	(8) Cincinnati	8.5
(2) Denver	1.2	(9) Cleveland	8.7
(3) Minneapolis	3.9	(10) St. Louis	9.3
(4) New Orleans	4.3	(11) Boston	11.6
(5) Los Angeles	4.9	(12) Buffalo	11.7
(6) Baltimore	7.6	(13) New York	12.2
(7) San Francisco	7.6	(14) Pittsburgh	21.2

In a general way the higher rates are associated with the larger cities and the lower rates with the smaller cities, thus seeming to imply a relation between the density of population and the prevalence of measles.

TABLE IX.

SCARLET FEVER DEATH RATES PER 100,000 TOTAL POPULATION.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Increase or Decrease.
Baltimore	8.4	4.4	5.6	+ 1.2
Boston	14.2	30.5	8.0	−22.5
Buffalo	13.7	7.7	4.8	− 2.9
Cincinnati	9.2	11.3	6.7	− 4.6
Cleveland	12.6	9.9	14.7	+ 4.8
Denver	19.3	29.4	13.2	−16.2
Los Angeles	4.4	6.6	2.1	− 4.5
Minneapolis	10.3	9.7	16.5	+ 6.8
New Orleans	5.5	10.8	1.2	− 9.6
New York	18.3	24.3	10.2	−14.1
Omaha	8.6	10.8	8.1	− 2.7
Pittsburgh	20.8	25.1	23.2	− 1.9
San Francisco	2.9	4.0	1.6	− 2.4
St. Louis	12.2	14.1	9.9	− 4.2

Table IX indicates that for most of the cities there has been a slight decrease in the death rates from scarlet fever. This would presumably indicate that there had been a decrease in the amount of scarlet fever. This, however, is not necessarily so, for the mortality from this disease varies in different epidemics and from year to year. The same is true of the other diseases in the group now being studied. It might appear to be better to use the number of cases of each disease in forming a judgment about the healthfulness of a place, but the fact that the number of cases which are reported for a disease is not nearly so complete as the number of deaths registered for the same disease is a serious objection to the use of this method. It may be noted in passing that while this paper is primarily concerned with judging healthfulness by a study of death rates, the author realizes that there may be other methods of attaining the same result.

A study of the scarlet fever rates places the cities in the following relative positions:

(1) New Orleans	1.2	(8) Omaha	8.1
(2) San Francisco	1.6	(9) St. Louis	9.9
(3) Los Angeles	2.1	(10) New York	10.2
(4) Buffalo	4.8	(11) Denver	13.2
(5) Baltimore	5.6	(12) Cleveland	14.7
(6) Cincinnati	6.7	(13) Minneapolis	16.5
(7) Boston	8.0	(14) Pittsburgh	23.2

It will be noticed that this rating is entirely different from that which obtains with measles.

TABLE X.

WHOOPING COUGH DEATH RATES PER 100,000 TOTAL POPULATION.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Increase or Decrease.
Baltimore	12.4	13.5	10.1	− 3.4
Boston	14.5	18.0	10.1	− 7.9
Buffalo	10.5	10.7	9.7	− 1.0
Cincinnati	7.4	6.0	10.5	+ 4.5
Cleveland	7.9	5.8	7.6	+ 1.8
Denver	8.0	7.0	5.7	− 1.3
Los Angeles	6.6	9.3	6.1	− 3.2
Minneapolis	7.3	7.6	7.0	− 0.6
New Orleans	7.5	5.1	3.4	− 1.7
New York	8.0	12.2	6.2	− 6.0
Omaha	10.0	12.0	5.8	− 6.2
Pittsburgh	21.6	25.1	12.2	−12.9
San Francisco	9.8	8.1	7.3	− 0.8
St. Louis	7.4	6.5	7.4	+ 0.9

In most instances it will be seen that there has been a decrease in the death rates from whooping cough. The following is the list of cities arranged as to their average death rates from whooping cough for the period 1912–1914:

(1) New Orleans	3.4	(8) St. Louis	7.4
(2) Denver	5.7	(9) Cleveland	7.6
(3) Omaha	5.8	(10) Buffalo	9.7
(4) Los Angeles	6.1	(11) Baltimore	10.1
(5) New York	6.2	(12) Boston	10.1
(6) Minneapolis	7.0	(13) Cincinnati	10.5
(7) San Francisco	7.3	(14) Pittsburgh	12.2

The relative positions of the cities in this list are somewhat similar to those in the list based upon the measles death rates.

TABLE XI.

DIPHTHERIA DEATH RATES PER 100,000 TOTAL POPULATION.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Increase or Decrease.
Baltimore	20.9	38.3	15.2	−23.1
Boston	34.0	63.6	20.0	−43.6
Buffalo	24.0	32.0	12.9	−19.1
Cincinnati	17.3	24.2	15.6	− 8.6
Cleveland	31.2	50.4	29.9	−20.5
Denver	21.3	33.4	4.8	−28.6
Los Angeles	16.7	26.7	7.5	−19.2
Minneapolis	33.2	61.0	24.3	−36.7
New Orleans	15.2	14.3	26.4	+12.1
New York	41.1	58.9	25.3	−33.6
Omaha	17.8	17.9	23.0	+ 5.1
Pittsburgh	34.3	46.6	32.1	−14.5
San Francisco	19.9	42.4	10.6	−31.8
St. Louis	28.4	47.9	27.8	−20.1

In all but two cases it will be seen that there has been a decline in the diphtheria death rates. This decrease has probably been in large measure due to the increased use of diphtheria antitoxin. By arranging the cities according to their diphtheria rates, the following result is obtained:

(1) Denver	4.8	(8) Omaha	23.0
(2) Los Angeles	7.5	(9) Minneapolis	24.3
(3) San Francisco	10.6	(10) New York	25.3
(4) Buffalo	12.9	(11) New Orleans	26.4
(5) Baltimore	15.2	(12) St. Louis	27.8
(6) Cincinnati	15.6	(13) Cleveland	29.9
(7) Boston	20.0	(14) Pittsburgh	32.1

This relative position of the cities somewhat resembles that obtained from the scarlet fever rates.

TABLE XII.

PNEUMONIA DEATH RATES PER 100,000 TOTAL POPULATION.

City.	Average Rates, 1900–1914.	Average Rates, 1900–1902.	Average Rates, 1912–1914.	Increase or Decrease.
Baltimore	196	207	194	−13
Boston	196	198	198	0
Buffalo	143	136	140	+ 4
Cincinnati	158	161	149	−12
Cleveland	133	166	114	−52
Denver	161	200	116	−84
Los Angeles	110	143	93	−50
Minneapolis	102	96	107	+11
New Orleans	170	185	156	−29
New York	237	276	190	−86
Omaha	122	122	131	+ 9
Pittsburgh	253	250	261	+11
San Francisco	154	181	131	−50
St. Louis	156	178	164	−14

Table XII plainly shows that in a general way the rates from pneumonia are slightly decreasing. The rates, however, clearly indicate that there is still much to be done in reducing the prevalence of this disease. The problem demands more attention from health authorities.

The pneumonia death rates give the following relative position to the cities:

(1) Los Angeles	93	(8) Cincinnati	149
(2) Minneapolis	107	(9) New Orleans	156
(3) Cleveland	114	(10) St. Louis	164
(4) Denver	116	(11) New York	190
(5) Omaha	131	(12) Baltimore	194
(6) San Francisco	131	(13) Boston	198
(7) Buffalo	140	(14) Pittsburgh	261

It will be readily observed that this rating is somewhat different from those obtaining for the other infectious diseases of the group being studied.

The results obtained by using the various methods are evidently not altogether comparable. That is, the cities do not consistently retain the same relative positions in the ratings. If a city is judged by one method it may hold first position; if judged by another method it may be third or fourth. All this goes to prove that any index based upon only one of the factors making up the health of a community is not an entirely satisfactory and just measure of its healthfulness.

The following table is presented to summarize the main points brought out in this paper. It brings together the relative positions obtained by each city from all the various rates studied. In addition, for purposes of comparison the relative position of each city is shown when an average of all its rates is taken as a basis for the grading.

TABLE XIII.

RELATIVE POSITIONS OF THE CITIES AS OBTAINED FROM VARIOUS DEATH RATES PREVIOUSLY PRESENTED.

City.	Typhoid.	Tuberculosis.	Age Group (1–4).	Diarrhoea (Under 2).	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria.	Pneumonia.	Total Average Rating.	Standardized Death Rate.
Baltimore....	14	10	12	11	6	5	11	5	12	13	13
Boston.....	3	7	10	9	11	7	12	7	13	10	9
Buffalo.....	10	5	8	13	12	4	10	4	7	8	8
Cincinnati...	1	11	6	6	8	6	13	6	8	9	11
Cleveland....	5	3	11	14	9	12	9	13	3	7	3
Denver.....	8	13	1	1	2	11	2	1	4	5	5
Los Angeles..	6	12	4	3	5	3	4	2	1	4	2
Minneapolis..	7	4	3	5	3	13	6	9	2	2	1
New Orleans.	13	14	9	10	4	1	1	11	9	12	14
New York....	2	9	13	8	13	10	5	10	11	11	6
Omaha.....	4	1	2	2	1	8	3	8	5	1	4
Pittsburgh...	12	2	14	12	14	14	14	14	14	14	12
San Francisco	11	8	5	4	7	2	7	3	6	3	10
St. Louis....	9	6	7	7	10	9	8	12	10	6	7

If Table XIII is read from left to right, some very interesting information is obtained. It shows the good and the weak points in the healthfulness of each city. It shows very plainly that the health of a city may be very good when viewed from one angle, but very poor when viewed from another. Take the following instances: When typhoid fever and tuberculosis are considered, Cincinnati holds the first and the eleventh positions respectively. Pittsburgh, as a rule, has a poor rating, but that from tuberculosis is very good. In the same way New Orleans, which generally has a poor rating, stands very well when scarlet fever and whooping cough are considered.

Table XIII indicates in a way the line of health work which should be most energetically undertaken by each city. A city with a poor rating from typhoid fever needs to devote more attention and more work to the problem of eradicating this disease than to diseases which give it a good standing.

The tables also furnish a basis on which to select a living place. A person with young children would not select Cleveland as a place in which to live because of the poor standing which this city has in the matter of diarrhoea of early childhood. In the same manner, anyone who wished to escape tuberculosis would not select New Orleans, and so on.

By comparing the average ratings and those based upon

the standardized death rates, a general idea can be obtained of the relative ranking of the cities considered from all points of view.

In conclusion it seems reasonable to make the following deductions:

1. The use of a life table furnishes the best single means of comparing communities in regard to their health.

2. The use of standardized death rates constitutes the next best method, and it is much to be preferred to the use of the crude death rates.

3. The infant mortality rate is not a satisfactory index of the health of the community, because in most instances there is no accurate method of expressing it.

4. The death rates from the various infectious diseases do not give comparable results. The death rate from a single disease apparently does not give a just and fair representation of the healthfulness of a city. In judging the healthfulness of a city, such rates should therefore be used with care and discretion.

THE IMPROVEMENT OF STATISTICS OF CAUSE OF DEATH THROUGH SUPPLEMENTARY INQUIRIES TO PHYSICIANS.

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The extension of the registration of vital statistics and the consequent increase in the amount of available data on American mortality have resulted in recent years in the development of a critical spirit toward these statistics. When data were scant, they were perforce accepted with little or no question; today we are justified in inquiring to what extent the returns are an accurate picture of the actual conditions. Perhaps enough material is now at hand to enable one to separate the probably true from the uncertain in our mortality returns. This questioning is clearly warranted by the likelihood that the sources of our statistics will thus be improved. It is only as our basic material is sound that the death rates we quote have real value.

The chief source of error in the statistics of mortality is, of course, the uncertainty of the primary diagnosis made by the physician certifying to the cause of death. A group of clinicians and pathologists, represented by Cabot,* Oertel,† and Emerson,‡ have in recent years contributed stimulating and constructive studies of the general reliability of diagnoses made in fatal cases. These writers point out, for example, that the acute infections, like typhoid fever, scarlet fever, and diphtheria, and those conditions which are usually of long duration and present distinct clinical pictures, like pulmonary tuberculosis and the external cancers, furnish no special difficulties of diagnosis to the physician, and statements with regard to them may be accepted without further question. On the other hand, bedside diagnoses, even in our best hospi-

* Cabot, Richard C., M.D.: Diagnostic Pitfalls I dentified during a Study of Three Thousand Autopsies Journal Amer. Medical Ass'n, December 28, 1912.

† Oertel, Horst, M.D.: The Inaccuracy of American Mortality Statistics, American Underwriter, May, 1913.

‡ Emerson, Haven, M.D.: Reliability of Certain Classes of Death Certificates, Amer. Jour. Public Health, August, 1915.

tals, of Bright's disease, of cerebral hemorrhage and apoplexy, and of certain of the heart affections are very frequently not confirmed by autopsy, while other determinative conditions are shown to have been the primary cause of death. Relief from this fundamental difficulty is not within the control of statisticians, but will depend entirely upon the improvement of autopsy facilities and the general rise of standards of medical education. A Committee of the Vital Statistics Section of the American Public Health Association is now actively engaged in considering the International List of Causes of Death from this point of view, registering its conclusions as to those titles which can be accepted with considerable certainty even in the absence of an autopsy, as against those which must be considered as tentative assignments only, unless based on autopsy findings.

The present paper bears on the remedy for a second important source of error which is largely within the scope and control of statisticians. Fortunately, this remedy can be applied at once and surprisingly large corrections in the death rate for certain causes can be made available. The method of procedure consists in attempting to secure from physicians completer statements as to the cause of death, in those cases where the returns on the death certificate are given vaguely or indefinitely, or where there is evidence that the original statements do not tell the entire story. Thus physicians often report conditions like "acute nephritis" as the cause of death, and do not refer at all to the primary condition, such as "scarlet fever," "influenza," or "alcoholism," which was present and known to them. Again, "peritonitis" is frequently reported without reference to the "appendicitis" or to the "puerperal septicemia" which may have preceded it. The various forms of death by violence are still reported vaguely, and without due regard for the statistical requirements of assigment to the International list of Causes of Death. Certificates frequently do not permit one to determine whether death was due to accident, suicide, or homicide, and what was the means and character of the injury.

This report is not the announcement of a discovery in the field of statistics. It is simply an attempt to put on record

the results of a method followed for four years in the Statistical Bureau of the Metropolitan Life Insurance Company, in the treatment of the industrial mortality experience of that company. We have realized that, if our material on the mortality of the American working classes is to be utilized to the full, every effort must be made to improve the quality of the basic data, especially since for many diseases and conditions the death rate is decidedly modified by the extent to which the query system is applied. The method is essentially that followed by the Registrar-General of England and Wales, and by the Division of Vital Statistics in the United States Census Bureau. We desire at this point to acknowledge our indebtedness to Mr. George H. Van Buren, Chief of that Division, who aided materially in the introduction of the method into our office. Both the English* and the American† bureaus have already, in their annuals and in other publications, called attention to the changes resulting from their systems of inquiry. A preliminary statement of the results obtained by our office appeared in the December, 1913, issue of this QUARTERLY.‡ In the present paper we shall discuss the effects upon our returns on the basis of the much more extensive data now available. It is our hope that this complete statement will encourage other workers to similar efforts, and that in this way the returns of health departments and insurance companies may become more accurate and comparable.

The technical procedure is as follows: The death certificates attached to the claim papers are carefully examined, and the staff engaged in this work determine whether the statement of cause of death given by the physician is satisfactory and complete for purposes of assignment. Statements of cause presenting no difficulty are at once classified according to the International List of Causes of Death. Joint causes are classified according to the precedents and rules of the International Committee, as best exemplified by the methods of the United

* Registrar-General of Births, Deaths and Marriages. Report, 1913, p. LXXIX.

† Bureau of the Census. Mortality Statistics, 1911, p. 36.
Bureau of the Census. Mortality Statistics, 1912, p. 23.
Van Buren, Geo. H.: Mortality Statistics and the Physician, Amer. Jour. Pub. Health, Dec., 1915.
Emerson, Haven, *loc. cit.*

‡ Dublin, Louis I.; Kopf, Edwin W.: Experiment in the Compilation of Mortality Statistics, this Quarterly, Dec., 1913.

States Census Bureau. Wherever the statement of cause is considered unsatisfactory for classification, or where, from the statement presented to the Company by the claimant or from other available sources, there is an indication that a serious condition not mentioned on the certificates has contributed to the death, or where additional information is required before a satisfactory assignment can be made, a letter of inquiry, asking for the facts, is sent to the physician. Clerical labor is minimized wherever possible through the use of form letters. A codified series of questions is employed, and the examiners indicate to the typists the question which is to be inserted in the form. The following is a copy of one of our series of letters sent to physicians:

NEW YORK CITY

Dear Doctor:

This Company is analyzing its mortality experience for the year 191 , and in order that we may be able to classify accurately the death of who died on , and whose certificate you signed, we most respectfully ask you to send us the following information in addition to the statement now appearing on the death claim, viz.:

Acute nephritis

Additional data desired:

Kindly indicate the primary cause of the ACUTE NEPHRITIS. Due to any contagious or infectious disease (scarlet fever, typhoid fever, etc.)? *Directly* due to alcoholism or exposure? Traumatic? If so, means of injury?

The claim was duly paid by this Company under date of 191 , and this desired information will be used for statistical purposes only. We are confident that your interest in the advancement of the scientific study of Causes of Death will prompt you to comply with our request, and we beg you to accept our thanks. A stamped envelope is enclosed for your reply.

Very respectfully yours,

Statistician.

(Please answer here)
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At first we proceeded cautiously, inquiring only as to the means and character of the injury in cases of ill-defined violence. We also asked for the causes for the relief of which operations were performed (when expressions such as "operation," "surgical shock," or "laparotomy" were reported with no additional data), the causes contributing to "peritonitis," and the

more exact location of cancers and tumors. We asked for additional information when the terms were "dropsy," "heart failure," and others of like character included in the designation "Ill-defined Diseases" in the International Classification. The scope of our questions has since been much extended. The following questions indicate the lines along which inquiry is now made:

UNDESIRABLE RETURNS AND CHARACTER OF INQUIRY MADE.

Undesirable Returns.	*Inquiry.*
1. "Injury," "Gunshot-Wound," "Drowning," "Accidental death," or other ill-defined violence.	Was death due to accident, suicide, or homicide? If accident, what kind of accident was the primary cause of death (steam railroad, street car, fall, etc.)?
2. "Operation," "Hysterectomy," "Laparatomy."	What was the cause, for the relief of which the operation was performed?
3. "Peritonitis."	Was the peritonitis secondary to typhoid fever? To tuberculosis? To puerperal septicemia? To appendicitis? If postoperative, what was the primary cause? Was it accidental, suicidal, or homicidal? If so, what was the means of injury?
4 "Acute nephritis."	What was the primary cause? Was it a contagious or infectious disease (scarlet fever, typhoid fever, etc.)? Was it directly due to alcoholism or exposure? Was it traumatic? If so, what was the means of injury?
5. "Meningitis," or "Cerebrospinal meningitis."	Was it epidemic? Tuberculous? Was it simple meningitis following lobar pneumonia, typhoid fever, or any other contagious or infectious disease? Was it traumatic? If so, what were the means and nature of the injury? Was it accidental, suicidal, or homicidal?
6. "Apoplexy."	Was this a case of cerebral hemorrhage?
7. "Paralysis."	Was it superinduced by cerebral hemorrhage? Was it a case of spinal paralysis? Of general paralysis of the insane?
8. "General paralysis of the insane."	Was it due to syphilis? If so, was the presence of syphilis determined by history or tests?
9. "Locomotor ataxia."	Was it of syphilitic origin? Traumatic? If so, what was the means of injury?

10. "Progressive paralysis."	Was it due to a spinal lesion? Was it directly or remotely due to cerebral hemorrhage?
11. "Tumor."	Was it malignant? What was its location?
12. "Cancer."	What was its location?
13. "Abscess."	What was its location? What was its nature and cause? Was it tuberculous? Traumatic?
14. "Burns."	Was death primarily due to burns received in burning building? (Such deaths are separately classified.)
15. Any terminal condition, origin not stated, such as "Septicemia," "Convulsions," or "Hemorrhage."	What was the primary cause?
16. "Acute cardiac dilatation," "Heart failure."	What was the primary cause?
17. "Pneumonia."	Was it lobar, bronchial, grippal, or tuberculous? Was it traumatic? If so, was death due to accident, suicide, or homicide, and what was the means of injury?

At the present time we are querying about 8.5 per cent. of the certificates of death received in our office. Satisfactory replies are obtained from physicians in about three quarters of the cases; the proportion varies somewhat with the condition queried. Changes are made in the classification, as the result of inquiry, in about 70 per cent. of the replies received. It is a pleasure at this time to acknowledge our indebtedness to the thousands of physicians whom we have addressed, and who, without reimbursement, have put at our disposal their time and opinion in order to help in the campaign to improve vital statistics. It is an encouraging commentary on the scientific interest of the American practitioner that such a large return could be received.

The following table shows the principal titles in which changes in assignment were made; it shows the number of deaths that would have been assigned to each title without inquiry, the number actually assigned after inquiry, and the ratio of the latter number to the former. The titles are arranged in the increasing order of these ratios.

TABLE I.

NUMBER OF DEATHS FROM CERTAIN CAUSES, BEFORE AND AFTER INQUIRY, AND PROPORTION OF LATTER TO FORMER ARRANGED IN INCREASING ORDER OF PROPORTIONS.

Metropolitan Life Insurance Company, Industrial Department; Mortality Experience, 1911–1914.

Cause of Death.		Deaths before Inquiry.	Deaths after Inquiry.	Deaths after Inquiry, per 100 Deaths before Inquiry.
International List Number.	Title.			
185	Fractures (causes not specified)	1,484	545	36.7
117	Simple peritonitis—nonpuerperal	1,180	711	60.3
066	Paralysis without specified cause	3,340	2,090	62.6
061	Simple meningitis	3,752	2,534	67.5
046	Other tumors (tumors of the female genital organs excepted)	266	196	73.7
062	Locomotor ataxia	714	558	78.2
186	Other external violence	1,456	1,158	79.5
067	General paralysis of the insane	2,042	1,627	79.7
119	Acute nephritis	4,186	3,375	80.6
020	Purulent infection and septicemia	820	725	88.4
094	Pulmonary congestion, pulmonary apoplexy	749	664	88.7
045	Cancer and other malignant tumors of other organs or of organs not specified	3,650	3,279	89.8
092	Pneumonia (lobar and undefined)	27,740	26,299	94.8
081	Diseases of the arteries, atheroma, aneurysm, etc.	6,390	6,199	97.0
120	Bright's disease	32,854	32,745	99.7
028	Tuberculosis of the lungs	60,486	60,613	100.2
009	Diphtheria and croup	8,850	8,881	100.4
156–163	Other suicides	2,660	2,674	100.5
029, 032–035	Other forms of tuberculosis	6,083	6,120	100.6
040	Cancer and other malignant tumors of the stomach	8,804	8,932	101.5
008	Whooping cough	1,995	2,025	101.5
001	Typhoid fever	6,343	6,440	101.5
155	Suicide by poison	1,666	1,696	101.8
006	Measles	3,137	3,216	102.5
007	Scarlet fever	3,681	3,778	102.6
039	Cancer and other malignant tumors of the buccal cavity	853	880	103.2
031	Abdominal tuberculosis	2,067	2,133	103.2
041	Cancer and other malignant tumors of the peritoneum, intestines, rectum	2,679	2,769	103.4
042	Cancer and other malignant tumors of the female genital organs	4,813	5,003	103.9
108	Appendicitis and typhlitis	3,807	3,959	104.0
043	Cancer and other malignant tumors of the breast	2,089	2,195	105.1
044	Cancer and other malignant tumors of the skin	574	604	105.2
064	Cerebral hemorrhage and apoplexy	21,727	23,029	106.0
182	Homicide by firearms	1,443	1,532	106.2
091	Bronchopneumonia	9,133	9,708	106.3
183–184	Homicide by other means	792	848	107.1
010	Influenza	3,995	4,370	109.4
A63	Other diseases of the spinal cord	1,248	1,389	111.3
030	Tuberculous meningitis	2,656	3,024	113.9
051	Exophthalmic goitre	368	433	117.7
056	Alcoholism (acute or chronic)	1,353	1,633	120.7
172	Traumatism by fall	3,575	4,432	124.0
037	Syphilis	1,322	2,350	177.8
038	Gonococcus infection	50	115	230.0
A61	Cerebrospinal fever	138	536	388.4

The indefinite title "fractures (cause not specified)" shows the greatest reduction in the number of assignments. The number of deaths after inquiry is only 36.7 per cent. of the

number originally returned. In view of the fact that the number of persons exposed is constant, the decrease in the number of deaths is accompanied by a corresponding reduction in the death rate. We may, therefore, say that the final death rate for this cause was 63.3 per cent. less than the one which would originally have been quoted. Such general titles as "other external violence" and "cancer of organs not specified" were in like manner greatly reduced through the determination of the nature of the violence, or of the location of the cancer. Considerable reductions were obtained upon inquiry into the character of such returns as "paralysis" and "locomotor ataxia"; for in such cases added information with reference to blood tests, etc., gave sufficient data upon which more definite assignments could be made. On the other hand, a large number of causes, especially those referring to the infectious diseases, show very little change. Tuberculosis of the lungs, for example, shows an increase of but .2 per cent. The infectious diseases of children, such as "measles" and "scarlet fever," give somewhat greater percentages of increase, 2.5 and 2.6 respectively; these increases were made at the expense of terminal conditions, such as "hypostatic pneumonia" and "acute nephritis," which are very often given as the causes of death. Cancers of definitely specified organs were considerably increased in the number of assignments, with a corresponding increase in the rates. Thus "cancer and other malignant tumors of the breast," of which there are many cases, showed an increase of 5.1 per cent. in the death rate. Such socially significant titles as "alcoholism," "syphilis," and "gonococcus infection" gave very marked rates of increase, 20.7, 77.8, and 130.0 per cent., respectively. That we could add two thirds as many deaths as were originally assigned to "syphilis" is in itself sufficient justification for the effort involved by our method. The greatest percentage of increase is shown by the title "cerebrospinal fever," which was increased from 138 to 536 deaths, or nearly fourfold.

The more definite titles to which some of the undesirable titles were changed are shown in the following table:

TABLE II.

ILL-DEFINED CAUSES OF DEATH, AND DEFINITE TITLES TO WHICH RE-ASSIGNED, BY NUMBER AND PERCENTAGE OF CHANGE IN CLASSIFICATION.

Metropolitan Life Insurance Company, Industrial Department; Mortality Experience, 1911–1914.

Ill-Defined Term as Classified before Inquiry.	Title Assigned after Inquiry.	Number and Percentage of Changes in Classification.	
		Number.	Percentage of Total Replies.
Purulent infection and septicemia (Total replies, 184.)	**Total changes from "Puerperal infection and septicemia"**	**134**	**72.8**
	"Other diseases of the uterus"	6	3.3
	Puerperal septicemia	54	29.3
	Acute abscess	8	4.3
	Other titles	66	35.9
Cancer and other malignant tumors of other organs or of organs not specified (Total replies, 572.)	**Total changes from "Cancer . . . not specified"**	**423**	**74.0**
	Cancer and other malignant tumors of the buccal cavity	25	4.4
	Cancer and other malignant tumors of the stomach	75	13.1
	Cancer and other malignant tumors of the peritoneum	61	10.7
	Cancer and other malignant tumors of the female genital organs	148	25.9
	Cancer and other malignant tumors of the breast	83	14.5
	Cancer and other malignant tumors of the skin	28	4.9
	Other titles	3	.5
Meningitis (Total replies, 1,653.)	**Total changes from "Meningitis"**	**1,234**	**74.7**
	Tuberculous meningitis	294	17.8
	Cerebrospinal fever	363	22.0
	Pneumonia	79	4.8
	Diarrhea and enteritis—2 years and over	62	3.8
	Other titles	436	26.4
Locomotor ataxia (Total replies, 321.)	**Total changes from "Locomotor ataxia"**	**163**	**50.8**
	Syphilis	148	46.1
	Other titles	15	4.7
Paralysis without specified cause (Total replies, 1,449.)	**Total changes from "Paralysis without specified cause"**	**1,259**	**86.9**
	"Other diseases of the spinal cord"	175	12.1
	Cerebral hemorrhage, apoplexy	885	61.1
	General paralysis of the insane	80	5.5
	Other titles	119	8.2
General paralysis of the insane (Total replies, 956.)	**Total changes from "General paralysis of the insane"**	**531**	**55.5**
	Syphilis	491	51.4
	Other titles	40	4.2
Organic diseases of the heart* (Total replies, 714.)	**Total changes from "Organic diseases of the heart"**	**264**	**37.0**
	Cerebral hemorrhage, apoplexy	46	6.4
	Pneumonia	72	10.1
	Other titles	146	20.4
Diseases of the arteries, atheroma, aneurysm, etc. (Total replies, 603.)	**Total changes from "Diseases of arteries, etc."**	**317**	**52.6**
	Syphilis	65	10.8
	Cerebral hemorrhage, apoplexy	166	27.5
	Other titles	86	14.3
Pneumonia† (Total replies, 3,005.)	**Total changes from "Pneumonia"**	**1,754**	**58.4**
	Influenza	228	7.6
	Bronchopneumonia	586	19.5
	Lobar pneumonia	577	19.2
	Other titles	363	12.1

* Most of the terms included under the title "organic diseases of the heart" are fairly definite. However, certain expressions like "acute cardiac dilatation" and "cardiac insufficiency" are often reported when they are only terminal symptoms of other diseases. It is these expressions that are covered by our inquiry.

†Assignments to "lobar pneumonia" should be regarded as confirmations of original assignments to "pneumonia," rather than as changes.

TABLE II—*Continued.*

Ill-Defined Term as Classified before Inquiry.	Title Assigned after Inquiry.	Number and Percentage of Changes in Classification.	
		Number.	Percentage of Total Replies.
Pulmonary congestion, pulmonary apoplexy (Total replies, 155.)	**Total changes from "pulmonary apoplexy"**	**99**	**63.9**
	Organic diseases of the heart	15	9.7
	Chronic bronchitis	6	3.9
	Pneumonia	8	5.2
	Bright's disease	8	5.2
	Other titles	62	40.0
Peritonitis—non-puerperal (Total replies, 575.)	**Total changes from "Simple peritonitis"**	**476**	**82.8**
	Abdominal tuberculosis	44	7.7
	Diarrhea and enteritis—2 years and over	20	3.5
	Appendicitis and typhlitis	105	18.3
	Salpingitis and other diseases of the female genital organs	45	7.8
	Puerperal septicemia	86	15.0
	Other titles	176	30.6
Acute nephritis (Total replies, 1,935.)	**Total changes from "Acute nephritis"**	**839**	**43.4**
	Scarlet fever	68	3.5
	Influenza	75	3.9
	Alcoholism (acute or chronic)	213	11.0
	Bright's disease	74	3.8
	Other titles	409	21.1
Other diseases of the uterus (Total replies, 173.)	**Total changes from "Other diseases of the uterus"**	**119**	**68.8**
	Gonococcus infection	15	8.7
	Cancer and other malignant tumors of the female genital organs	7	4.0
	Uterine tumor (noncancerous)	13	7.5
	Cysts and other tumors of the ovary	6	3.5
	Salpingitis and other diseases of the female genital organs	21	12.1
	Puerperal septicemia	35	20.2
	Other titles	22	12.7
Traumatism by firearms (Total replies, 119.)	**Total changes from traumatism by firearms**	**95**	**79.8**
	Suicide by firearms	6	5.0
	Homicide by firearms	87	73.1
	Other titles	2	1.7
Fractures (cause not specified) (Total replies, 1,045.)	**Total changes from "Fractures (cause not specified)"**	**949**	**90.8**
	Traumatism by fall	646	61.8
	Traumatism by crushing—electric railway	33	3.2
	Traumatism by crushing—steam railway	25	2.4
	Traumatism by crushing—automobiles	27	2.6
	Traumatism by crushing—other vehicles	51	4.9
	Traumatism by other means	57	5.5
	Other titles	110	10.5
Other external violence (Total replies, 504.)	**Total changes from "Other external violence"**	**400**	**79.4**
	Purulent infection and septicemia	15	3.0
	Traumatism by fall	161	31.9
	Traumatism by machines	23	4.6
	Traumatism by crushing—steam railway	29	5.8
	Traumatism by crushing—electric railway	16	3.2
	Traumatism by crushing—automobiles	17	3.4
	Traumatism by crushing—other vehicles	37	7.3
	Other titles	102	20.2
Ill-defined diseases (Total replies, 442.)	**Total changes from "Ill-defined diseases"**	**322**	**72.9**
	Malaria	15	3.4
	Tuberculosis of the lungs	18	4.1
	Organic diseases of the heart	83	18.8
	Bright's disease	21	4.8
	Other titles	185	41.9

Letters were received from physicians in connection with 1,653 cases originally diagnosed as "meningitis." In 1,234 of these cases, or 74.7 per cent., the classification was changed to other and more definite titles. "Cerebrospinal fever" received 22 per cent. of the original "meningitis" returns; "tuberculous meningitis," 17.8 per cent.; and "pneumonia (lobar and undefined)," 4.8 per cent. The title "paralysis without specified cause" was the subject of 1,449 replies; the classification was changed in 1,259 instances, or 86.9 per cent. The larger proportion (61.1 per cent.) of these "paralysis without specified cause" cases were classified under "cerebral hemorrhage and apoplexy." "Peritonitis" was changed in classification in 476 out of 575 cases, or 82.8 per cent. These changes were credited chiefly to the titles "appendicitis and typhlitis," "puerperal septicemia," "salpingitis," and other diseases of the female genital organs.

Ill-defined returns of "traumatism by firearms" were changed in 79.8 per cent. of the cases queried. The greater part (73.1 per cent.) of these deaths was assigned to the title "homicide by firearms." "Fractures (cause not specified)" were a fruitful source of additions to the class of "traumatism by fall"; 646 ill-defined fractures (61.8 per cent.) were so assigned.

After this examination of the ill-defined terms and the more definite titles to which they were assigned, we may proceed naturally to the other aspect of the change; namely, to determine how the mortality is constituted in those causes which show an increase in the number of deaths. This is indicated by Table III.

TABLE III.

ADDITIONS TO CERTAIN CAUSES OF DEATH FROM INDEFINITE TITLES, NUMBER AND PERCENTAGE CHANGED FROM EACH INDEFINITE TITLE.

Metropolitan Life Insurance Company, Industrial Department; Mortality Experience, 1911–1914.

Cause of Death Title Receiving Additions.	Title before Inquiry.	Additions.	
		Number.	Per Cent.
Typhoid fever	Total changes to "typhoid fever"	**101**	**100.0**
	Simple meningitis	29	28.7
	Organic diseases of the heart	3	3.0
	Pneumonia	5	5.0
	Other diseases of the intestines	6	5.9
	Simple peritonitis	16	15.8
	Acute nephritis	21	20.8
	Bright's disease	3	3.0
	Cause of death not specified or ill-defined	3	3.0
	Other titles	15	14.9
Measles	Total changes to "measles"	**89**	**100.0**
	Whooping cough	3	3.4
	Simple meningitis	19	21.3
	Bronchopneumonia	9	10.1
	Pneumonia	31	34.8
	Acute nephritis	13	14.6
	Other titles	14	15.7
Scarlet fever	Total changes to "scarlet fever"	**98**	**100.0**
	Simple meningitis	7	7.1
	Bronchopneumonia	4	4.1
	Pneumonia	3	3.1
	Acute nephritis	68	69.4
	Bright's disease	5	5.1
	Other titles	11	11.2
Whooping cough	Total changes to "whooping cough"	**45**	**100.0**
	Simple meningitis	12	26.7
	Convulsions of infants	2	4.4
	Bronchopneumonia	6	13.3
	Pneumonia	14	31.1
	Pulmonary congestion, pulmonary apoplexy	2	4.4
	Acute nephritis	5	11.1
	Other titles	4	8.9
Diphtheria and croup	Total changes to "diphtheria and croup"	**35**	**100.0**
	Acute endocarditis	2	5.7
	Organic diseases of the heart	2	5.7
	Diseases of the larynx	6	17.1
	Acute bronchitis	2	5.7
	Bronchopneumonia	4	11.4
	Pneumonia	3	8.6
	Diseases of the pharynx	2	5.7
	Acute nephritis	10	28.6
	Other titles	4	11.4
Influenza	Total changes to "influenza"	**394**	**100.0**
	Simple meningitis	40	10.2
	Pneumonia	228	57.9
	Acute nephritis	75	19.0
	Other titles	51	12.9
Tuberculosis of the lungs	Total changes to "tuberculosis of the lungs"	**166**	**100.0**
	Simple meningitis	6	3.6
	Organic diseases of the heart	6	3.6
	Chronic bronchitis	6	3.6
	Pneumonia	70	42.2
	Cause of death not specified or ill-defined	16	9.6
	Other titles	62	37.3
Tuberculous meningitis	Total changes to "tuberculous meningitis"	**377**	**100.0**
	Meningitis	294	78.0
	Other titles	83	22.0

TABLE III—*Continued.*

Cause of Death Title Receiving Additions.	Title before Inquiry.	Additions.	
		Number.	Per Cent.
Syphilis	Total changes to "syphilis"	**1,631**	**100.0**
	Locomotor ataxia	148	14.4
	Other diseases of the spinal cord	59	5.7
	Cerebral hemorrhage, apoplexy	34	3.3
	Paralysis without specified cause	34	3.3
	General paralysis of the insane	491	47.6
	Diseases of the nervous system other than those specified	96	9.3
	Diseases of the arteries, atheroma and aneurysm	65	6.3
	Other titles	104	10.1
Cancer and other malignant tumors of the stomach and liver	Total changes to "cancer and other malignant tumors of the stomach and liver"	**130**	**100.0**
	Cancer and other malignant tumors of other organs or of organs not specified	75	57.7
	Other tumors (tumors of the female genital organs excepted)	7	5.4
	Diseases of the esophagus	4	3.1
	Other diseases of the stomach	7	5.4
	Other diseases of the liver	13	10.0
	Other titles	24	18.5
Cancer and other malignant tumors of the female genital organs	Total changes to "cancer and other malignant tumors of the female genital organs"	**190**	**100.0**
	Cancer and other malignant tumors of other organs or of organs not specified	148	77.9
	Other tumors (tumors of the female genital organs excepted)	7	3.7
	Uterine tumor (noncancerous)	7	3.7
	Other diseases of the uterus	7	3.7
	Other titles	21	11.1
Cancer and other malignant tumors of the breast	Total changes to "cancer and other malignant tumors of the breast"	**106**	**100.0**
	Cancer and other malignant tumors of other organs or of organs not specified	83	78.3
	Nonpuerperal diseases of the breast (cancer excepted)	9	8.5
	Other titles	14	13.2
Alcoholism	Total changes to "alcoholism"	**289**	**100.0**
	Simple meningitis	14	4.8
	Acute nephritis	213	73.7
	Cause of death not specified or ill-defined	10	3.5
	Other titles	52	18.0
Cerebrospinal fever	Total changes to "cerebrospinal fever"	**401**	**100.0**
	Simple meningitis	363	90.5
	Other titles	38	9.5
Cerebral hemorrhage, apoplexy	Total changes to "cerebral hemorrhage, apoplexy"	**1,408**	**100.0**
	Paralysis without specified cause	885	62.9
	Organic diseases of the heart	46	3.3
	Diseases of the arteries, atheroma, aneurysm	166	11.8
	Bright's disease	137	9.7
	Other titles	174	12.4
Organic diseases of the heart*	Total changes to "organic diseases of the heart"	**287**	**100.0**
	Cerebral hemorrhage, apoplexy	10	3.5
	Paralysis without specified cause	13	4.5
	Acute endocarditis	10	3.5
	Diseases of the arteries, atheroma, aneurysm	14	4.9
	Pneumonia	12	4.2
	Pulmonary congestion, pulmonary apoplexy	15	5.2
	Acute nephritis	25	8.7
	Bright's disease	9	3.1
	Senility	13	4.5
	Fractures (cause not specified)	11	3.8
	Ill-defined organic disease	39	13.6
	Cause of death not specified or ill-defined	43	15.0
	Other titles	73	25.4

*See footnote on this title in Table II.

TABLE III—*Continued.*

Cause of Death Title Receiving Additions.	Title before Inquiry.	Additions.	
		Number.	Per Cent.
Diseases of the arteries, atheroma, aneurysm	Total changes to "diseases of the arteries, atheroma, aneurysm"	**126**	**100.0**
	Other diseases of the spinal cord	5	4.0
	Softening of the brain	9	7.1
	Paralysis without specified cause	9	7.1
	Organic diseases of the heart	6	4.8
	Pneumonia	5	4.0
	Pulmonary congestion, pulmonary apoplexy	4	3.2
	Acute nephritis	10	7.9
	Gangrene	28	22.2
	Senility	10	7.9
	Cause of death not specified or ill-defined	4	3.2
	Other titles	36	28.6
Bronchopneumonia	Total changes to "bronchopneumonia"	**660**	**100.0**
	Simple meningitis	32	4.8
	Pneumonia	586	88.8
	Other titles	42	6.4
Pneumonia (lobar and undefined)	Total changes to "pneumonia"	**329**	**100.0**
	Simple meningitis	79	24.0
	Organic diseases of the heart	72	21.9
	Pleurisy	13	4.0
	Simple peritonitis (nonpuerperal)	10	3.0
	Cerebral hemorrhage, apoplexy	10	3.0
	Bright's disease	44	13.4
	Other titles	101	30.7
Appendicitis and typhlitis	Total changes to "appendicitis and typhlitis"	**156**	**100.0**
	Intestinal obstruction	6	3.8
	Simple peritonitis (nonpuerperal)	105	67.3
	Other titles	45	28.8
Bright's disease	Total changes to "Bright's disease"	**235**	**100.0**
	Cerebral hemorrhage, apoplexy	7	3.0
	Organic diseases of the heart	19	8.1
	Diseases of the arteries, atheroma, aneurysm	13	5.5
	Pulmonary congestion, pulmonary apoplexy	8	3.4
	Acute nephritis	74	31.5
	Other diseases of the kidneys and annexa	12	5.1
	Senility	7	3.0
	Fractures (cause not specified)	9	3.8
	Ill-defined organic disease	16	6.8
	Other titles	70	29.8
Puerperal state—total	Total changes to "puerperal state—total"	**338**	**100.0**
	Purulent infection and septicemia	54	14.7
	Convulsions (nonpuerperal)	32	8.7
	Pneumonia	15	4.1
	Simple peritonitis (nonpuerperal)	87	23.6
	Acute nephritis	58	15.8
	Bright's disease	26	7.1
	Uterine hemorrhage (nonpuerperal)	4	1.1
	Other diseases of the uterus	40	10.9
	Other titles	52	14.1
Puerperal septicemia	Total changes to "puerperal septicemia"	**189**	**100.0**
	Purulent infection and septicemia	50	26.5
	Simple peritonitis	77	40.7
	Diseases of the uterus	32	16.9
	Other titles	30	15.9
Puerperal albuminuria and convulsions	Total changes to "puerperal albuminuria and convulsions"	**125**	**100.0**
	Convulsions (nonpuerperal)	32	25.6
	Acute nephritis	54	43.2
	Bright's disease	26	20.8
	Other titles	13	10.4

TABLE III—*Concluded.*

Cause of Death Title Receiving Additions.	Title before Inquiry.	Additions.	
		Number.	Per Cent.
Suicide	Total changes to "suicide"	**46**	**100.0**
	Acute poisonings	24	52.2
	Absorption of deleterious gases (conflagration excepted)	10	21.7
	Traumatism by firearms	6	13.0
	Fractures (cause not specified)	2	4.3
	Other titles	4	8.7
Traumatism by falling	Total changes to "traumatism by falling"	**945**	**100.0**
	Simple meningitis	43	4.6
	Fractures (cause not specified)	646	68.4
	Other external violence	161	17.0
	Other titles	95	10.1
Homicide—total	Total changes to "homicide"	**148**	**100.0**
	Simple peritonitis (nonpuerperal)	7	4.7
	Traumatism by firearms	87	58.8
	Fractures (cause not specified)	15	10.1
	Other external violence	16	10.8
	Other titles	23	15.5

Of the 101 cases added to typhoid fever, 28.7 per cent. were originally classified as "simple meningitis," 20.8 per cent. as "acute nephritis," and 15.8 per cent. as "simple peritonitis." There were 89 additions to "measles," 98 to "scarlet fever," 45 to "whooping cough," and 35 to "diphtheria and croup," making an addition of 267 deaths to these four diseases of childhood. "Acute nephritis" played an important part in the original assignment in all of these four diseases, but more especially in "scarlet fever," where 68 deaths, or 69.4 per cent. of the changes, were originally so classified. In like manner, "bronchopneumonia" and "pneumonia" (unspecified), were the original assignments in many of these conditions; this applies particularly to "measles" and "whooping cough." Except for "diphtheria," the indefinite title "simple meningitis" is a convenient cloak for the acute infections of childhood. "Influenza" and" tuberculosis of the lungs" both received significant additions from the title "pneumonia," the former receiving 228 additional deaths and the latter 70. Of the total changes to tuberculous meningitis, 294, or 78.0 per cent., were originally classified as meningitis.

An analysis of the sources of the additions to syphilis is interesting. Of the 1,031 changes to this title, 148 were from locomotor ataxia, 491 from general paralysis of the insane, and 104 from a large number of conditions, connected for the

most part with spinal lesions. Our inquiries with reference to "general paralysis of the insane" have definitely confirmed the virtually unanimous opinion of clinicians that this condition is syphilitic in origin. So uniform is our finding, that we are considering seriously the advisability of discontinuing our inquiries into this condition, and assuming the existence of syphilis in such cases.

As might be expected, the additions to "cancers of specified organs" are at the expense of the residual title, "cancers of organs not specified." The importance of this change is obvious in view of the increasing interest in the location of the malignant growths. The number of deaths from "acute and chronic alcoholism" was increased at the expense of "acute nephritis"; 213 out of 289 deaths, or 73.7 per cent., were so added. It will be unnecessary to go further into this analysis, since the various parts of the table speak for themselves.

The foregoing tables and text are sufficient to indicate the possibilities inherent in the intensive questioning of mortality returns. It does not lie within the power of the statistician to correct errors which depend upon the diagnostic ability of physicians, or upon circumstances which do not permit adequate opportunity for case observation or for accurate clinical or pathological findings. There is, however, a class of errors which he can undoubtedly reduce to a minimum. He can raise the standard of accuracy in mortality statistics by inviting the physician to give information such as he is able and willing to impart. It is reasonable to assume that the physician will, at first, have in mind not so much the statistical use of the information which he possesses as the immediate and uppermost clinical phase of the case. His efforts in the last stage of a losing battle against disease or injury are so often devoted to combating serious complications, that he is more than likely to certify only the immediate and not the primary cause of death. The statistician can tactfully point out to him an error of omission. Experience has demonstrated that, in a large proportion of cases, physicians manifest sufficient interest in the precision of our vital statistics to supply the additional and qualifying statements. As inquiries are made, moreover, physicians become more and more aware of the requirements

of statistical technique in making assignments. An analysis of our returns shows an increasing proportion of satisfactory statements for certain causes of death. A physician to whom an inquiry is once sent will usually not make the same indefinite statement in his subsequent certificates of death.

This means for advancing the accuracy of cause of death statistics is at hand in every registration and compiling office, and it is hoped that it will soon be adopted by vital statisticians generally. The fruitful character of the returns, affecting as they do the basic material of vital statistics, the simplicity of the method, and its low cost both in time and in money, indicate plainly the desirability at the present time of inquiries to physicians as an integral part of the classification of causes of death. Certainly the day has arrived when material cannot be admitted into the realm of good vital statistics unless it has previously been subjected to careful inquiry such as we have outlined above. That is the least which can be expected, in view of the uncertainty of much of the material, due in the first instance to errors of bedside diagnosis uncorrected by autopsy.

STATISTICAL TABULATION AND PRACTICE.*

By Roland P. Falkner, Ph.D., *Alexander Hamilton Institute.*

Nowadays the use of statistics is widespread and resort to tables or to graphic representation permeates modern literature on all subjects. There seems scarce a subject under heaven which someone does not present to us in tabular form or seek to make clear to us by means of charts and diagrams. What was at one time the peculiar reserve of the statistician and the economist has become the hunting ground of all the sciences, the pseudo sciences, and the advertiser. Statistics have become a common language. Into this language, whether in tables of figures or in graphic forms, everyone ventures boldly without even a Meisterschaft or a correspondence course preparation.

Most of us have blundered into it, and even those who may with best right claim to be experts, would admit that with them statistics is more of a habit than a principle. The result is an extreme diversity in habits of expression, which defeats the first purpose of statistical methods, whether in figures or diagrams, which is clearness of expression for groups of facts.

It is perhaps in the field of graphic presentation that the tyro indulges in the wildest flights of misrepresentation. The search for the striking and unusual leads to a perversion of fact. But when there is not conscious effort, inexperience often leads to confusing and misleading attempts to portray facts graphically. Earnest efforts are being made by the joint committee whose report was printed in the December issue of the Quarterly Publications to establish definite standards and, if they succeed in this laudable endeavor, much misdirected energy should be turned into profitable channels. Very little has been done in the search for standards in constructing and printing statistical tables.

The problems of tabular presentation of facts are comparatively simple and have not consciously been faced by

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many statisticians. For that reason, they are also somewhat technical, but they are none the less real. The object of this paper is to present certain considerations in regard to arrangement and use of tables, with a view to raising the question whether standardization is necessary or advisable.

Problems of tabular presentation have had little consideration outside of government bureaus of statistics, each of which in the interest of uniformity in its publications, and wholly independent of the others, has developed rules governing the practice to be followed. There seems to be no reason why a like need should not be felt by the larger research foundations and by the statistical journals.

The ordinary printed table, perhaps not more than four or five columns wide and oftentimes not more than half as deep as the page on which it is printed, offers little difficulty. The eye takes in all its parts at a glance and the arrangement is not of vital importance. Difficulties begin only with larger tables. These we shall consider, and if rules for their construction were to be adopted, it would seem reasonable to apply such rules to smaller tables as well.

Without pretending to exhaust the infinite complexity of facts and their relations which may be expressed in tabular form, our attention will be directed to certain frequently recurring types which it is hoped will sufficiently emphasize what appear to be underlying principles of table construction.

The Whole and Its Parts, Stub Arrangement. One of the most frequent series of facts to be recorded is when facts are given for some total, say a geographic unit and its component parts, these being arranged in the stubs (Exhibit A).

The common arrangement is to name the parts first and place the total at the bottom (Table I). The reason given for such an arrangement is usually that in a sum in addition, the total is placed at the bottom. This would be conclusive if the addition were the main fact presented in the table, but it is obviously subsidiary. The chief interest attaches to the relations of the parts to the whole, and as there is one factor common to all these relations, the total, this is the most conspicuous fact to be exhibited.

EXHIBIT A.

POPULATION, AREA AND DENSITY, NEW ENGLAND, 1910.

Alternative Arrangement.

I.

Division and State	Population	Area in Sq. Miles	Population per Sq. Mile
Maine	742,371	29,895	24.8
New Hampshire	430,572	9,031	47.7
Vermont	355,956	9,124	39.0
Massachusetts	3,366,416	8,039	418.8
Rhode Island	542,610	1,067	508.5
Connecticut	1,114,756	4,820	231.3
New England	**6,552,681**	**61,976**	**105.7**

II.

Division and State	Population	Area in Sq. Miles	Population per Sq. Mile
New England	**6,552,681**	**61,976**	**105.7**
Maine	743,371	29,895	24.8
New Hampshire	430,572	9,031	47.7
Vermont	355,956	9,124	39.0
Massachusetts	3,366,416	8,039	418.8
Rhode Island	542,610	1,067	508.5
Connecticut	1,114,756	4,820	231.3

It is not infrequent that we desire to display the whole in relation to *some* of its component parts, *e. g.*, total wheat production in bushels and most important wheat producing states, without *all* parts. Here the analogy with a sum in addition fails entirely.

If in such a table, the center of interest is the total, in our illustration, New England, it cannot fail to be noted that this arrangement places the most conspicuous fact in the poorest position in the table as respects legibility. If a table extends over a page, this disadvantage is greatly emphasized. Many tables of the Statistical Abstract require the book to be turned up and fill two pages with the total at the bottom of the second page. Here a poor adjustment of the pages further complicates the situation. One table given here often covers 30 pages with the total on the last page. (Table 237, 1913, pp. 412 to 441. Exports of domestic merchandise.)

The census usage places the total at the top (Table II). This obviates all the disadvantages of the common arrangement. It places the most conspicuous fact in the posi-

tion where it is most easily read whether the table occupies two inches, a page, or several pages. It represents a finished product, not a process. Hence any conclusions drawn from the process of addition do not apply. The parts displayed need not under this arrangement equal the total. Parts may be omitted, or parts may be subdivided as for instance where in a list of states it may be desirable following New York State, to give the same facts for New York City.

The Whole and Its Parts, Box Arrangement. Convenience of arrangement not infrequently dictates placing the whole and its parts in the box heads rather than the stub (Exhibit B.)

EXHIBIT B.

PER CENT. OF TOTAL POPULATION IN CERTAIN AGE CLASSES, NEW ENGLAND, 1910.

Alternative Arrangements.

I.

Ages in Years	Me.	N. H.	Vt.	Mass.	R. I.	Conn.	New England
Under 5.....	9.7	9.2	9.6	9.8	10.0	10.1	9.8
5–14.....	17.7	17.0	18.0	17.2	17.6	17.7	17.4
15–24.....	17.1	17.4	16.8	18.5	19.5	18.8	18.3
25–44.....	28.2	29.2	28.5	32.5	32.0	31.7	31.4
45–64.....	18.9	19.2	18.8	16.7	16.2	16.3	17.1
67 and over.....	8.2	7.9	8.2	5.2	4.6	5.3	5.9

II.

Ages in Years	New England	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Under 5.....	9.8	9.7	9.2	9.6	9.8	10.0	10.1
5–14.....	17.4	17.7	17.0	18.0	17.2	17.6	17.7
15–24.....	18.3	17.1	17.4	16.8	18.5	19.5	18.8
25–44.....	31.4	28.2	29.2	28.5	32.5	32.0	31.7
45–64.....	17.1	18.9	19.2	18.8	16.7	16.2	16.3
65 and over.....	5.9	8.2	7.9	8.2	5.2	4.6	5.3

Here again alternative arrangements are possible. Frequently the whole is placed last in the column (Table I) and this follows similar impulses which led to putting the total at the bottom of the stub. We read from left to right and if the total is regarded as the result of the parts the last column is the logical place for it. Cross addition is less frequently used than up and down addition, but when it is used, it generally proceeds from left to right.

But if we emphasize the fact that a statistical table is a result and not a process, all the weight of argument, whatever may be the usage, favors placing the total in the column following the stub (Table II). Here it can be most easily read, and as it is often the central fact around which the table revolves, it is entitled to the best place.

Sequences, Stub Arrangement. A frequent type of statistical table shows similar facts for a sequence of years or months, the facts being recorded in the boxes, the years or months in the stubs (Exhibit C).

EXHIBIT C.

DENSITY OF POPULATION, NEW ENGLAND, 1860–1910.

Different Arrangements.

I.

Year.	New England.	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
1860	50.6	21.0	36.1	34.5	153.1	163.7	95.5
1870	56.3	21.0	35.2	36.2	181.3	303.7	111.5
1880	64.7	21.7	38.4	36.4	221.8	259.2	129.2
1890	75.8	22.1	41.7	36.4	278.5	323.8	154.8
1900	90.2	23.2	45.6	34.7	349.0	461.6	188.5
1910	105.7	24.8	47.7	39.0	418.8	508.5	231.3

II.

Year.	New England.	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
1910	105.7	24.8	47.7	39.0	418.8	508.5	231.3
1900	90.2	23.2	45.6	37.7	349.0	461.6	188.5
1890	75.8	22.1	41.7	36.4	278.5	323.8	154.8
1880	64.7	21.7	38.4	36.4	221.8	259.2	129.2
1870	56.3	21.0	35.2	36.2	181.3	203.7	111.5
1860	50.6	21.0	36.1	34.5	153.1	163.7	95.5

III.

Year.	New England.	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
1910	105.7	24.8	47.7	39.0	418.8	508.5	231.3
1860	50.6	21.0	36.1	34.5	153.1	163.7	95.5
1870	56.3	21.0	35.2	36.2	181.3	203.7	111.5
1880	64.7	21.7	38.4	36.4	221.8	259.2	129.2
1890	75.8	22.1	41.7	36.4	278.5	323.8	154.8
1900	90.2	23.2	45.6	37.7	349.0	401.6	188.5
1910	105.7	24.8	47.7	39.0	418.8	508.5	231.3

The usual order places the earliest date at the top and the latest at the bottom. As we read a page from top to bottom,

we naturally expect a sequence in this order (Table I). While this arrangement corresponds with the normal order of a sequence it has the disadvantage of placing the last date in the most inconspicuous position.

A contrary arrangement familiar in census publications places the latest date at the top and the earliest date at the bottom (Table II). Perhaps all of us have seen men who were not figuratively, but literally as bald as a billard ball. It disconcerted us at first, but in time we got used to it. This table produces the same effect. Constant use may familiarize us, but we never quite forget the shock of first acquaintance. Its awkwardness remains and we constantly find ourselves reading down instead of up, and a conscious effort is necessary to get at the true meaning.

None the less, the census usage is not a monstrosity but well founded. It should be remembered that the primary interest in census figures is the picture which they give of present conditions and these are emphasized when the latest figures are given the first place.

The reason for such totally different practices lies in the distribution of emphasis. What is most important, the sequence or the present status? The first arrangement emphasizes the sequence, the second the present status. Both of these factors of importance enter into any figures of this character.

In this apparently insoluble conflict, it may be that the most satisfactory usage would be a compromise which repeated the latest year and gave it both the first and the last place (Table III).

Sequences, Box Arrangement. When the years or months appear in the boxes, a somewhat similar situation arises (Exhibit D).

If the normal sequence from left to right is followed (Table I), the last date comes in the last column in the least conspicuous part of the table where it is least easily read. In so far as the interest centres in present conditions as in census enumerations, this is a distinct disadvantage.

EXHIBIT D.

DENSITY OF POPULATION—NEW ENGLAND, 1860-1910.

Different Arrangements.

I.

Division and State.	1860.	1870.	1880.	1890.	1900.	1910.
New England	**50.6**	**56.3**	**64.7**	**75.8**	**90.3**	**105.7**
Maine	21.0	21.0	21.7	22.1	23.2	24.8
New Hampshire	36.1	35.2	38.4	41.7	45.6	47.7
Vermont	34.5	36.2	36.4	36.4	37.7	39.0
Massachsetts	153.1	181.3	221.8	278.5	349.0	418.8
Rhode Island	163.7	203.7	259.2	323.8	401.6	508.6
Connecticut	95.5	111.5	129.2	154.8	188.5	231.3

II.

Division and State.	1910.	1900.	1890.	1880.	1870.	1860.
New England	**105.7**	**90.3**	**75.8**	**64.7**	**56.3**	**50.6**
Maine	24.8	23.2	22.1	21.7	21.0	21.0
New Hampshire	47.7	45.6	41.7	38.4	35.2	36.1
Vermont	39.0	37.7	36.4	36.4	36.2	34.5
Massachusetts	418.8	349.0	278.5	221.8	181.3	153.1
Rhode Island	508.5	401.6	323.8	259.2	203.7	163.7
Connecticut	231.3	188.5	154.8	129.2	111.5	95.5

III.

Division and State.	1910.	1860.	1870.	1880.	1890.	1900.	1910.
New England	**105.7**	**50.6**	**56.3**	**64.7**	**75.8**	**90.3**	**105.7**
Maine	**24.8**	21.0	21.0	21.7	22.1	23.2	24.8
New Hampshire	**47.7**	36.1	35.2	28.4	41.7	45.6	47.7
Vermont	**39.0**	34.5	36.2	36.4	36.4	37.7	39.0
Massachusetts	**418.8**	153.1	181.3	221.8	278.5	349.0	418.8
Rhode Island	**508.5**	163.7	203.7	259.2	323.8	401.6	508.5
Connecticut	**231.3**	95.5	111.5	129.2	154.8	188.5	231.3

On the other hand, the arrangement of dates so that the latest immediately follows the stub and the earliest comes in the last column (Table II) as in the census publications, offends our natural instinct to read from left to right and interferes with the ease with which the sequence is comprehended.

Here again a compromise between conflicting interests may be suggested by giving first the latest date, giving earlier ones in the natural order, and repeating for the sake of the sequence the last date in the last column (Table III).

Mechanical Aids to Clearness. The object of the statistical table is to compress into a small space a body of information the narration of which in the text would be cumbersome and exhausting to the reader. It is in short a method of condensation, and it is of the utmost importance that, as it tells so much in so small a compass, it tell it as clearly as practicable. Statisticians cannot and others should not, therefore, neglect the various mechanical aids to clearness which are available. These are chiefly differences in type and rules. The total should always be distinguished from the parts either by the use of heavier type, or by a rule or space separating it from the parts, or by both methods. When the total is in the box head, a double rule or heavy rule is advisable.

In a chronological series emphasis can be placed upon the latest date by similar methods and this is often times desirable.

Numbers and Titles for Tables. The usual practice is to give each table a number and no other method affords such a simple plan for identification in the text comment. It has sometimes been argued that numbering tables makes them a thing apart from the text instead of part and parcel of the treatment of subject. Without contesting the plausibility of this argument, it must be admitted that a table of figures is just as much and no more a part of the text than is a map in any geographical publication. It is somewhat less distinct perhaps than an illustration, but a certain separateness cannot be denied and cannot be avoided by ignoring it. The omission of table numbers leads to difficulties in practice which it is the first duty of the statistician to avoid.

Whether tables should have titles as well as numbers is largely a question of taste. Larger tables commonly have such titles, but they are often omitted in text tables. If the title is helpful in text references, it should not be omitted. My personal preference is for the use of titles in every instance no matter how large or how small the table. In any case, long titles are to be avoided. The practice of some government bureaus of giving in the title all the elements which enter into the box heads, involves useless repetition. When, for any reason, long descriptive titles are felt to be necessary, a compromise may be effected by the use of a short catch title, followed by the descriptive title.

Contents of Tables, Abbreviated Statements. The contents of statistical tables vary so much according to the nature of the problems involved, that it might seem that we should look in vain for any general rules. However, one type of problem constantly recurs wherever round numbers or percentages are used. Statistical accuracy is often served by giving such larger items as wheat production, value of farms, manufactured products in terms of millions of dollars. Yet our practice in such cases is to grasp after even greater exactness. We may give one decimal after the millions as notice perhaps that the numbers are not round after all. Then we add up the abbreviated figures and carefully adjust the decimals to see that they add up exactly to the sum given in the detailed figures.

Again we frequently have a division of some total into percentages. These again are often given with one or two decimals attached. Again we are obsessed with the idea that the sum of such percentages should equal 100 and we painfully "adjust" them to bring about such a result.

In any proceeding of this kind, we are obliged in some measure to twist facts to make them suit the table. If we were to really grasp the idea that in presenting a statistical table, we are giving not a sum in addition but a finished result, we should not expect our tables to prove. Whether the sum of our percentages equalled 99.7 or 100.5, each item would be correctly stated and we should have done no violation to our conscience in doctoring the figures to get the desired result.

Conclusion. A few of the questions which arise in the practice of statistics have been discussed in this paper. To those who are not at least in some degree versed in the subject, they might appear trivial and inconsequential. But to those who are interested in perfecting the precision of their instruments of thought and expression, they have their significance. If the aim of all statistical statements is clearness and sanity we cannot neglect anything which contributes to this end.

STATISTICAL STANDARDIZATION IN WASHINGTON.*

By Julius H. Parmelee, Ph.D., *Statistician, Bureau of Railway Economics.*

Dr. Falkner has wisely handled the important subject of standardization in a concrete and helpfully suggestive fashion. I am glad of the opportunity of continuing the good work, if possible, by adding a few concrete suggestions regarding the problem, pointing my remarks with especial reference to conditions in Washington.

The field of government work, here in Washington, offers perhaps the best opportunity for standardization of statistical effort. Here are a number of federal bureaus, of which the Census Bureau is the best example, devoted exclusively or principally to the compilation of statistics, while thirty additional bureaus and offices are engaged more or less extensively in statistical work. Some of these bureaus cover fields that overlap, but although there exists at all times the danger of statistical duplications, or even contradictions, I think it safe to say that the danger has been a continually diminishing one during the past few years.

Turning specifically to the problem of standardization as applied to the statistical work of the government, we find that in September, 1908, the President appointed an Interdepartmental Statistical Committee of ten members under the jurisdiction of the Secretary of Commerce and Labor. This committee was selected mainly from among the government statisticians of Washington. Among other things, the committee was directed to make recommendations:

(1) With a view of establishing uniform definitions of statistical terms.

(2) With a view of introducing uniform methods.

(3) In regard to schedules and accompanying instructions relative to any new line of statistical inquiry; above all, to test the results achieved, and to investigate whether they are

* Paper presented at the annual meeting of the American Statistical Association, Washington, D. C., December 29, 1915.

in harmony with each other and modern statistical methods and practice.

These directions, it will be noted, go to the very heart of the problem of standardization. When uniformity has been achieved in definition of terms and in methods, and harmony with the best statistical practice has been attained, the goal of standardized presentation is not far removed.

However, this goal too nearly approached the ideal to be gained at once. The committee, together with a subcommittee on duplication of government statistics, held a number of sessions, and issued two or three reports. The investigations of the two committees traversed the whole field of statistical work in Washington, but a large part of the discussion centered around the advisability of establishing a central statistical office to serve as a clearing house for all the departments and bureaus of the federal government.

So far as I know, the matter went no further than these reports. Technically, however, the Interdepartmental Committee is still in existence, and could once more be ordered to conduct investigations in the direction of standardization, if the proper initiative were taken. In other words, the machinery for setting standardization methods in motion is still existent.

Before turning to a concrete instance of statistical standardization and its needs in the federal organization, let me point out that a government bureau should first of all standardize its own work. It ought not to be possible to say that an important bureau in Washington tabulates statistics of retail prices and of wages and hours of labor, summarized on such different forms as to make it almost futile to bring them together, except in a most limited way; yet this is the fact. Again, the different bureaus should coöperate with each other to attain the greatest degree of uniformity and standardization. This is being done by means of informal conferences and agreements, the appointment of such committees as the Interdepartmental, and the like. In the third place, there should be greater coöperation, necessarily involving a certain amount of standardization, between the federal government on the one hand and state and local governments on the other hand.

Perhaps the best illustration of the crying need for statistical standardization of this latter sort grows out of the requirement of periodic or occasional reports of the operations of public service corporations, especially railways. Development of this method of securing statistical reformation for purposes of regulation has been extremely rapid. A certain Eastern railway system, operating through eight states, is required to make over 144,000 separate reports each year to federal, state, and local officials. These reports cover every conceivable phase of finance and operation. Many of the reports cover the same, or similar, ground; yet the blanks or forms provided for the reports are not always uniform as between federal and local requirements. The Interstate Commerce Commission has been doing good work in the direction of standardization by furnishing public service commissions of various states with blank forms similar to those on which the Interstate Commission itself requires reports from steam and electric railways, from express companies, and from sleeping car corporations. These forms are utilized by many state commissions for the reports which they require from railroads or other public service corporations operating in their respective states. More than four fifths of the states now use the Interstate Commerce Commission standard form for steam railways. The saving in energy and expense to roads operating in several states is clearly considerable. In addition the Interstate Commission furnishes standard forms to three fifths of the states for reports from electric railways, to two thirds of the states for express company reports, and to ten states for sleeping car company reports.

Yet even here there is further need for standardization. While forty state commissions require annual reports from the railways on the standard Interstate Commerce Commission forms, the statistical tabulations prepared by them on the basis of those same standard forms are anything but standard. In fact, even a hasty glance through the latest statistical reports of the state railway commissions—and regulatory commissions exist in some form in 46 of the 48 states of the Union—discloses almost as many varieties of statistical presentation as there are reports.

I do not wish to be understood as arguing that absolute uniformity of statistical presentation is desirable in these state reports. It is always a question, in fact, how far standardization may be attainable without the sacrifice of special interests and within the requirements of individual states. There exists room for desirable uniformity, however, in certain fundamental features of statistics as presented. Certainly, any one who has ever attempted to utilize the statistical tables of two or more state railway commissions knows how impossible it is to bring them into line with each other.

Clearly no better opportunity exists for improvement of statistical work, especially in the direction of uniformity and standardization, than in this field of railway statistics. The reports are rendered on a standard form, the first step in the process of standardization, but their compilation is on anything but a uniform or standard basis. I would suggest to members of the two Associations meeting here this morning that there is no better field for their efforts than to labor for greater uniformity, and consequent serviceability, in the presentation of statistics of the transportation industry.

CLASSIFICATION AND LIMITATIONS OF STATISTICAL GRAPHICS.

By E. A. Goldenweiser.

Graphic methods of presenting statistical facts have been in use from times immemorial and are doubtless destined to become increasingly popular. Mr. Willard C. Brinton's book on Graphic Methods of Presenting Facts (*The Engineering Magazine*, 1914) and the subsequent creation of a committee of representative men from various fields of endeavor for the study and standardization of graphics are indications of the increasing interest in the matter and are themselves in part responsible for this increased interest. The committee has made a preliminary report* in which it lays down seventeen elementary rules to be followed in presenting facts graphically. Considering the wide divergence of interests on the part of the members of the committee, which includes engineers, economists, statisticians, psychologists, mathematicians, accountants, educators, and others, the report must be considered as a substantial achievement and a decided step in the direction of standardization. The great need of standardization was perhaps the principal fact impressed upon the visitor to the exhibit of graphics held under the auspices of the committee in connection with the sessions of the Second Pan-American Congress and of the various scientific societies that met in Washington, the last week of December, 1915.

It is the object of this paper to contribute to the work of standardization by attempting to classify the uses of graphic methods and to delimit briefly their fields of greatest usefulness. The discussion is confined to statistical graphics and does not touch upon devices like organization charts, routing charts, and the like, the subject matter of which is not statistical.

Statistical graphs may be classified in the first place according to method of presentation and secondly in relation to primary object. The classification on both of these bases might be presented as follows:

* See Quarterly Publications of the American Statistical Association, December, 1915, p. 790.

STATISTICAL GRAPHICS.

Method of presentation.	Object.
I. Publication in books or bulletins.....	1. Reference 2. Illustration 3. Analysis 4. Research
II. Use at lectures.....	1. Reference 2. Illustration 3. Analysis
III. Use in exhibits.....	1. Reference 2. Illustration 3. Analysis

The discussion will take up the graphs devoted to each of the four primary objects and will refer to the methods of presentation only incidentally. It may be noted at the start that graphs are often, if not generally, used for more than one of the objects mentioned, and quite properly so; nevertheless, a clear understanding of the primary object for which the graph is prepared will be helpful in deciding on its character and arrangement.

1. Reference Graphs. A graph, like a general table, may be prepared with no other object than to present a given set of facts. A curve showing the value of exports during a series of years is such a graph; a series of forty-eight bars showing the population of each state is another; and a map showing, by means of dots, the distribution of a crop is a third. The map, however, contains certain elements of correlation: the geographic location and concentration of the crop stands out; it appears whether the crop is in the South, the North, or the West; furthermore, a common knowledge of the location of the principal cities and rivers superimposes a mental set of correlations, even if the map is actually shown in bare outline. If the map shows isotherms, isobars, or topographic contours, it becomes an analytical graph. As a general proposition reference graphs are seldom of value unless they carry a time series, like the curve, or a geographic relationship, like the map. In other words, their value is dependent on their being more than pure repositories of facts. The bar

diagram mentioned would probably be valueless unless the states were arranged in descending order, thus introducing a relationship. It may be said, therefore, that reference graphs are to be used with caution; they are often a waste of time and space. If used at all, reference graphs must be absolutely simple and clear, for their only excuse is that they may be more easily comprehended by eye-minded readers than a statistical table which is generally more compact, more accurate, and more easily handled.

Graphic methods are most effectively applied not to raw material but to results. There would be little excuse for stating this were it not for the fact that numerous graphs are published that have no apparent object other than to reproduce unassorted facts. Such graphs may be of some use in a lecture by helping the lecturer to pin his words to a concrete exhibit, but in a printed publication or an exhibit a graph should never be shown unless it helps bring out some significant relationship more clearly than do the text and tables.

2. Illustrative Graphs. An illustrative graph differs from a reference graph in that the former is selective while the latter is inclusive. A bar diagram comparing the corn production of Illinois with that of the United States is illustrative; so is a series of bars showing the number of deaths from given causes. An illustrative graph is very useful in print, as well as in lectures or exhibits, because it helps to fix in the mind of the reader some important fact that may be the keynote of a discussion. Such a graph should be very simple since it is an appeal to visual memory, and if, in order to remember correctly, one needs to keep in mind many items and qualifications that are not impressed on the eye, the graph loses a considerable part of its usefulness. An illustrative graph may be comparatively complex and not self-explanatory if it is intended for use in connection with a lecture where the speaker has the opportunity of pointing out the significance of the chart. Such a graph serves a somewhat different purpose from that of graphs on a printed page: it has a psychological value in giving the audience something to look at and helps hold their attention. This advantage

is forfeited, however, when the lecturer has too many charts, or exhibits more than one at a time, or spends too much time in adjusting one after the other. In such cases the attention of the audience is diverted from rather than attracted to the discussion.

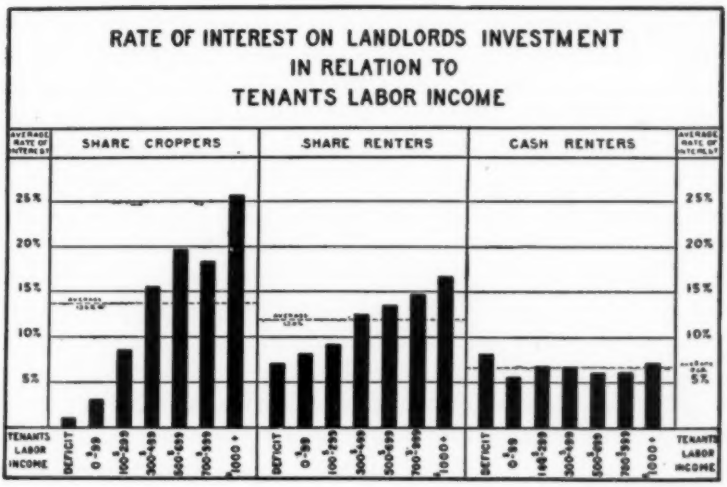
3. Analytical Graphs. An analytical graph is seldom used except in connection with printed text or a lecture; at an exhibit it would demand too much explanation. An analytical graph is one that is introduced into a discussion in order to show visually a relationship that the author wishes to emphasize. A graph consisting of two curves—one showing the value of the potato crop through a series of years and the other the production of the same crop—is analytical. The two curves are brought together in order to emphasize the circumstance that a large crop often results in so low a price that the total value of the large crop is smaller than that of a smaller crop harvested during another year. Such a graph is of distinct value because the correlation is made much plainer by the curves than it can be made by text and tables alone. A map showing mean summer temperature and the distribution of a crop is analytical in that it exhibits the temperature control of the crop. Another illustration of an analytical graph is shown in the accompanying diagram, taken from a bulletin of the Department of Agriculture.*

The fact that the landlord's rate of interest varies greatly in one class of tenure in conjunction with the tenant's income, while in the second class the variation is much less, and in the last class it is insignificant, stands out more clearly from this graph than from any amount of discussion. One may perhaps be justified in the belief that it is in the field of analysis that lies the greatest usefulness of statistical graphics. A graph of this sort not only visualizes a conclusion previously reached but even helps to reach the conclusion and thereby approaches the last type of graph to which we now turn.

4. Research Graphs. A research graph is one that helps establish an unknown correlation as a result of plotting ascertainable data. This type of graph, used largely in the laboratory and in print, is more common in engineering and natural

* U. S. Dep't of Agr. Bulletin No. 337, p. 13.

science than in statistics, but statisticians sometimes receive hints of possible relationships from experimental research graphs. These graphs are not, like the others, primarily a method of presenting, but of discovering a relationship. This highest form of graphics lies on the fringe of the subject of this paper and may be respectfully dismissed with these few words.



In conclusion, it may be stated that the great need in statistical graphics, as in statistics, is not for greater output but for higher quality. Standardization of method is highly desirable, but it is essential for statisticians to understand clearly that graphic methods for them are merely subsidiary and are valuable as a rule only in so far as they help to popularize the results of study. A transformation of a table into a graph, and especially of a good table into a bad graph, is not a statistical achievement. The statistician should not permit his interest in the graphic presentation of his material to divert him from his main work of careful statistical interpretation, the insufficiency of which is today the crying need in the study of social conditions.

THE USE OF THE CORRESPONDENCE METHOD IN ORIGINAL RESEARCH.

By Asher Hobson, *University of Wisconsin.*

This paper is neither a defense nor an advocacy of the correspondence method of conducting original research. It is an analysis of the process with a view to understanding its best use in those cases where the personal-interview method cannot be employed. This analysis is based upon the results of the experience of the Department of Agricultural Economics at the University of Wisconsin, in the use of correspondence in conducting original research studies in the field of marketing. The department has tried different types and forms of letters in gathering the same sort of data, and has tabulated the results from the standpoint of efficiency—number and reliability of answers. While the conclusions drawn may not hold true in all lines of original research, they must be applicable, generally speaking, to the field of economics.

As compared with the personal interview method of gathering data from original sources, correspondence is open to much criticism. On the whole it can safely be said that the correspondence method is unsatisfactory because of the unreliability of the data obtained in this manner. The indefiniteness and inaccuracy of answers, which in most cases are due to misinterpretation of questions, give rise to a large percentage of error. But with all its faults, its use is indispensable to the investigator in gathering certain classes of data. First hand information which pertains to a wide area or data concerning segregated districts separated by great distances can only be obtained, without the expenditure of large sums, by correspondence. There are times, therefore, when correspondence is the only agency to be considered, and the vital question is how to eliminate the errors resulting from its use.

Nature of Questions. Statisticians state the truism that questions should be few in number, very simple and easy to answer. But the problem is not solved by that formula; for

the difficulty arises on the one hand in attempting to make the questions few enough, simple enough and easy enough to answer in order that the replies may be definite and trustworthy, and on the other in embodying enough in them to cover the field desired.

One sometimes wonders whether the required simplicity can be attained in all cases. It is surprising from how many different angles a seemingly simple question will be answered. An inquiry addressed to wholesalers over the country as to the wholesale price of cheese for a certain day or week would quite likely result in data pertaining to (1) the wholesaler's selling price, some quotations including freight and some not, (2) the wholesaler's buying price with freight charges considered in some cases, (3) and moreover different answers would pertain to different kinds of cheese, while (4) some replies would refer to foreign and some to domestic varieties of the same kind. It is safe to predict that the one question would be answered in many different ways.

The results of the experience of this department in its attempt to overcome the above difficulty point to the superiority of what might be called a one-question letter. This type of letter certainly has tendencies toward simplicity in that the questions are reduced to a very few—quite often one—which allows for minute qualifications.

Another advantage in asking only one or a few questions is that it tends to overcome that antagonistic spirit encountered by so many economic investigations. Prejudice is a barrier which the economist must always be prepared to meet. Many of his problems pertain to personal matters, private business and stocks in trade, so to speak. Because of these prying propensities he is looked upon with suspicion. To ask a business man for his handling margins is little short of impertinence, to say nothing of the probability of his answer being a prejudiced one. But to ask one merchant for his buying price under certain conditions, and another merchant for his selling price under the same conditions is a different matter. Questions which are abstract and impersonal and not connected with a series of other questions will be rewarded by more and franker answers. Hence the one-question letter,

like the example below, goes a long way in overcoming that everpresent none-of-your-business attitude.

MADISON, WIS., May 2, 1914.

GENERAL GROCER CO.,
CHICAGO, ILLINOIS.

Gentlemen:

The Wisconsin Agricultural Experiment Station is making an effort to collect all the information possible on the subject of marketing. At present we are studying the marketing of cheese. If you will kindly fill in the blank below and return it to us, your coöperation will be greatly appreciated.

Yours very truly,
WISCONSIN AGRICULTURAL EXPERIMENT STATION,

Per_____

Wholesale Selling Price of Cheese, f. o. b. your station—for *last week* in March, 1914.

In cents per pound.

American.	Swiss.	Brick.	Limburger.
	Imported Domestic		

From whom do you buy your cheese?

Name of firm_____

Address_____

Use other side for remarks.

However, this type of letter has its drawbacks. If only one question is asked when the answers to five are wanted, more letters will be required than if each letter had contained all five questions.

The chief claim for the correspondence method is its cheapness, yet no method is cheap that does not give fairly correct results. Hence the questionnaire manner of securing data is not cheap unless it can be made reliable. Postage alone costs $40 per 1,000 letters, including stamped return envelopes. Consequently, it is a loss of time and money to send out bulky, complex questionnaires which are likely to be incorrectly answered, or more often not answered at all. The greater

cost of the meager letter is offset in a large degree by a higher percentage of answers, to say nothing of the trustworthiness of the answers. The only absolute limitation on this type of questionnaire is a mailing list so meager as not to permit its division into different groups.

Verifying the Data. Any information, however secured, should be verified if possible. One means of doing this is by getting the same sort of data from different sources. For instance, take the question of middleman charges in a simple form. The producer's selling price is the same as the manufacturer's or dealer's buying price, the manufacturer's selling price is the jobber's buying price, and the jobber's selling price is the retailer's buying price. Each step affords two widely different sources for the same information. But the checking up of the retailer's selling price cannot be done in the same manner, since the consumer buys under such varying conditions that their buying price would be of little value as an index.

In such a case one must depend upon his own knowledge of the subject as to whether the answers are representative. Question the incentive toward misrepresentation. What motive would the correspondent have in misstating the facts? Answer this question by framing a letter that will reduce such a motive to a minimum. The principal idea of a few disconnected questions is to eliminate this wish to misrepresent. To ask a retailer for his selling price of a specific commodity is more apt to result in a reliable answer than if the request were accompanied by others pertaining to his business.

Data that cannot be verified by collection from different sources should be submitted to a critic who is in a position to be able to detect errors. This critic will be, generally, a man actively engaged in the field of business which is being investigated. But, on the whole, instances are rather rare in which given data cannot be verified by comparison with those from different sources.

Help the Correspondent. Avoid bulk. Letters should not only contain a very few questions, but also a very few pages—one if possible. A bulky questionnaire often looks more formidable than it really is and for that reason is thrown in the waste basket without serious consideration. A one-page

letter which can be answered on the same sheet on which it is written has a distinct advantage. (See sample letter p. 212.) Its appearance of simplicity, and ease in answering, invites immediate attention. There are no extra pages to mislay or lose. Moreover it saves asking for the name and location of the correspondent, which are quite essential in most investigations—the location especially—and which are often omitted by the correspondent even when requested. This omission is due in some cases to carelessness and in other cases to a dislike—conscious or unconscious—in having a direct connection between the information and its source. The salutation on the one-page letter which is returned with the answer, saves the investigator the trouble of asking for name and address and the correspondent the trouble of writing them. Even though they were cheerfully given, the investigator should ask no questions which he can answer himself.

But even one question may at times necessitate the use of more than one page. In such cases form blanks should be constructed in sufficient detail to allow filling in with the least possible exertion. Avoid the asking of general questions since they often involve lengthy explanations. Blanks should be so constructed as to make explanations as few as may be. It is sometimes possible for the investigator to analyze the question minutely, and so construct the blank that the answers can be given by a series of check marks.

The idea is not to require the correspondent to make one stroke of the pen that can be made for him.

Incentive to Answer. Answers to letters asking for information depend in most cases upon the good will of the one upon whom the request is made and who is not interested in the promotion of the investigation, hence feels himself under little or no obligation to answer. For this reason it is well for the investigator, if possible, to so word his questions as to shift the answering from a basis of mere accommodation to one of interest. An experience will serve as an illustration. The Department of Agricultural Economics at the University of Wisconsin made an attempt to secure information concerning the organization of Wisconsin cheese factories—whether coöperatively or privately managed—in order to construct a

map showing the location of each type. After two rather unsuccessful letters, the third was sent out to the factories to the effect that a map of the state was being constructed, showing the location of its cheese factories, and if they cared to be represented upon this map, they should "fill in the blank below immediately." The returns were gratifying.

Providing the results of the investigation are intended for free distribution, it is a good plan to offer to send a copy upon its publication to those who will indicate their desire for it in their answer. This necessitates a reply in order to put in an application for the results of the writer's work. The following is an illustration of such an incentive: "If you are interested in our work on cheese marketing we will gladly send you the bulletin immediately upon publication."

It is sometimes well to offer special inducements for replies. The following paragraph contained in a letter to Wisconsin creamerymen illustrates this point:

"In order to show our appreciation of an immediate reply we will mail you the average monthly price paid for butterfat by coöperative creameries in the state, and also the price paid by private companies, in order that you may compare them with your prices. Kindly indicate on the back of this page if you wish these figures."

The Make-up of a Circular Letter. A circular letter cannot easily be disguised, nevertheless its appearance should be that of a personal one. The expense of getting out circular letters by the use of the typewriter is prohibitive. The mimeograph process is cheaper, but its imitation of typewriting is so defective as to exclude its use except in writing to a class of people who do not readily differentiate between grades of correspondence. On the whole, the cheapness of mimeographing is offset by a decrease in replies. The better method is that of multigraphing. It costs slightly more than mimeograph work but is an exact representation of typewriting which permits the use of that machine in filling in specific salutations at the head of each letter.

Avoid the use of "Dear Sir"; or "Madam"; which may apply with equal appropriateness to the president of our country or the village blacksmith. Effective circular letters

must have an air of the personal. This requires a signature and not the use of a stamp.

To Whom to Write. The tendency is to write to those directly interested; that is, get farming information from farmers, and retailing data from merchants. But such procedure is not always best. In some cases those directly interested are the ones who should not be approached. Many people dislike to give information about their own business, but are quite willing to divulge the nature of some one else's business. A retailer will often tell of a wholesaler's methods, as he has experienced them, when he will not converse about his own business procedure.

In considering whom to approach, first enumerate the different classes who can furnish the information. Then write to those who will be least prejudiced against answering, and those who are best prepared to handle correspondence. This department has discontinued the sending of questionnaires to farmers if the information can be secured from other sources, because of the low percentage of answers. Their failure to reply is not due, in most cases, to an unwillingness to answer, but to neglect. The handling of correspondence is not included in their daily routine. Questionnaires are forgotten, misplaced, or lost. It is not an uncommon occurrence to receive answers from farmers a year after the request has been sent. Hence our policy is to write professional men concerning general agricultural matters of their communities. The banker is acquainted with practices and business methods while the postmaster also is pretty well versed on local affairs.

The Mailing List. It is a broad statement to say that no matter what the class of people with whom one wishes to correspond, there is a published mailing list of some sort or other which contains their names and addresses. It may be the city directory, the commercial club roll, the county tax list, a financial register or one of the numerous commercial gazetteers. It may be issued for individual cities, by counties, by states or for the whole United States. At least a published list of some sort is obtainable.

The problem is not in being able to secure the names of a certain class, but in choosing the ones in the class who can

furnish the desired information. For instance, a very complete wholesale grocery directory would be of little value in the investigation of wholesale prices of Swiss cheese, since only a small percentage of grocery jobbers handle this variety of cheese. A directory containing the names of all the farmers in a state would be of little use to an investigator working on dairy butter problems in that state, if only one out of every twenty farmers made dairy butter.

The most complete commercial directory is apt to be incomplete as regards the needs of a particular investigator. A state directory of retailers omits the merchant in the cross-roads town. A state directory of wholesalers designates those handling cheese, but it doesn't differentiate between the kinds of cheese. So another broad generalization can be made to the effect that no matter how complete a commercial directory may be the probabilities are that it will not suit all needs.

This brings one to the problem of making up a mailing list to suit individual requirements. An illustration will best explain the situation. Suppose an investigator who is making a study of the marketing of dairy butter. His commercial list does not contain the names of merchants located in small towns and they are the very ones who handle dairy butter. If he followed his farmer's directory he would have to write twenty letters in order to reach one farmer who made butter. As a result both lists are discarded. Since postmasters are not permitted to give out the names of their patrons, he writes to the station agents of rural towns briefly explaining his difficulty. Then when writing to the merchants whose names the agent submits, he in turn asks for the name of farmers from whom they buy their dairy butter.

Take a different situation—that in which a majority of the class do not handle the commodity in question—Swiss cheese and the wholesale grocer. In such instances it is sometimes necessary to obtain the names of the customers of those handling the commodity in its preceding stage. In order to secure a list of wholesalers handling Swiss cheese it would be necessary to obtain the names of those to whom the dealers sold. (Dealer is a technical term applied to a cheese middleman who intervenes between factory and jobber.) However, it is

a very difficult task to obtain such a list from a commercial firm. Information of that sort in the hands of competitors would be injurious, to say the least. For this reason one should not resort to this means of compiling a mailing list, unless it cannot be made up from other sources.

Knowledge of the Subject. By all means one should possess a fair knowledge of the field which his investigation covers before making out the questionnaires. This working knowledge is best gained by some field work, supported by supplementary reading. If the investigator has not the opportunity to acquaint himself with the field except by correspondence, then his proposed questions should be submitted for criticism to someone who does know the subject in question, in order that none but intelligent inquiries be included. To expose one's ignorance of a subject by asking insignificant or irrelevant questions that are matters of common knowledge to members of the trade, is to create a prejudice against the letter which forestalls reply.

REVIEWS AND NOTES.

CASUALTY ACTUARIAL AND STATISTICAL SOCIETY OF AMERICA.

On November 7, 1914, the first organization meeting of the Casualty Actuarial and Statistical Society of America was held at the City Club in New York City. Arrangements were made for founding a Society to study the statistical and actuarial science of casualty and social insurance. The following officers were elected:

OFFICERS AND COUNCIL.

President ..... I. M. RUBINOW*

Vice-Presidents ..... BENEDICT D. FLYNN*, ALBERT H. MOWBRAY*

Secretary-Treasurer ..... CLAUDE E. SCATTERGOOD*

Librarian-Editor ..... WINFIELD W. GREENE*

Other Members of Council

	Term Expires.
JAMES D. CRAIG	1915
R. K. ORR	1915
FREDERICK L. HOFFMAN	1916
ALBERT W. WHITNEY	1916

At the first dinner of the Society, informal addresses were made on the various aspects of casualty and social insurance. The first number of the proceedings of the Society contained the articles entitled "Scientific Method of Computing Compensation Rates," by I. M. Rubinow, and "Valuation of the Death Benefits Provided by the New York Compensation Law," by W. W. Greene and a collection of reviews and notes which included an extensive bibliography of current literature on the foundations of casualty and social insurance.

The second volume of the proceedings was devoted to a discussion of the immediate problems facing the Society and gave also a competent review of the subject of workmen's compensation reserves.

The third number was devoted to a presidential address by Dr. Rubinow on schedule rating and to a number of papers on the same subject by fellows of the Society.

The fourth number of the proceedings contained an index of the first volume and articles of general statistical interest as follows:

The Classification of Industries for Workmen's Compensation Insurance, by E. H. Downey.

Note on the Application of Recent Mathematical-Statistical Methods to Coal Mine Accidents, by Arne Fisher.

A New Graphic Method of Using the Normal Probability Curve, by Buckner Speed.

*Members of council, *ex-officiis*.

The fifth meeting of the Society was held in New York City on February 25 and 26, 1916, and the following papers were read and discussed:

Mortality from External Causes among Industrial Policyholders of the Metropolitan Life Insurance Company, 1911–1914, Louis I. Dublin.

Work of the Bureau of Accident and Health Statistics, Benedict D. Flynn.

Cost Accounting in Casualty Insurance, Claude E. Scattergood.

Compensation Cost of Industrial Diseases, James D. Maddrill.

Statistics necessary for Computing Compensation Rates, Edward Olifiers.

American Methods of Compensating Permanent Partial Disabilities, I. M. Rubinow.

Since the initial meeting of the Society the following changes have occurred in the membership of the Council: Richard Fondiller was elected Editor-Librarian and Messrs. Harwood E. Ryan and Joseph H. Woodward succeeded the retiring members of the Council whose terms expired in 1915.

Examinations will be held for admission to associateship and fellowship in the Society during the first week in May, 1916.

The Society's committee on workmen's compensation statistics has published a classification of industries for general use in the compilation of industrial accident and compensation cost statistics. The classification appears in the November, 1915, number of the Monthly Review of the United States Bureau of Labor Statistics. This committee has under advisement for early publication a classification of accidents by cause and nature.

E. W. Kopf.

MEDICAL STATISTICS IN ENGLAND.

The organization of the Medical Research Committee in connection with National Health Insurance in the United Kingdom is, perhaps, the most important enterprise in British medical statistics since the establishment of the statistical department of the British Army in 1858.

Under the National Insurance Act of 1911 a fund of £55,000 became available for the use of the Committee. Researches are conducted in several departments of the Committee. The one on statistics is directed by Dr. John Brownlee. Some of the papers prepared and published by the department in the first year of the Committee's work are:

"Investigations into the Periodicity of Infectious Diseases." *Public Health*, March, 1915.

"Four Studies in the Meaning and Relationships of Birth and Death Rates." *Journal of Hygiene*, Vol. XV, No. 1, July 30, 1915.

"Historical Note on Farr's Theory of Epidemics." *British Medical Journal*, Aug. 14, 1915.

After the beginning of the war the Committee offered their resources to the War Office. The statistical department is now conducting the compilation of the sickness statistics of the Home and Expeditionary forces. Arrangements for transcribing the records of the military hospitals have

been made. In addition, the statistical department has undertaken the sorting and classification of the medical and surgical case sheets from the hospitals. This work renders case history information readily available for the use of medical officers with the forces abroad.

Dr. Brownlee and his assistants have also made a statistical investigation into the principal characteristics of the male population of the German Empire and have transmitted the report to the British Government.

The first annual report of the Committee is now available.

E. W. KOPF.

Unmarried Girls with Sex Experience. Bureau for Social Research of the Seybert Institution, Philadelphia, Carol Aronovici, Ph.D., Director. Bulletin I. 48 pp.

This is a study in a small way of the immoral girls under institutional care in the city of Philadelphia. Altogether 616 girls were studied, 392 in the House of Correction, 147 in the House of Refuge, 55 in the Magdalen Home, and 22 in the Midnight Mission. The principal results of the study were to show that in a large majority of cases the girls came from families in which the relationship between parents was abnormal, or where one of the parents was away from home. That feeble-mindedness was a decisive factor in causing immorality was not proved. To place such girls in domestic service was to expose them to peculiar temptations. It was recommended that industrial employment rather than domestic service be found for girls discharged from these institutions.

The statistical evidence afforded by this study corroborates the evidence afforded by other investigations of a similar nature in this country. The tables as a rule are well planned and intelligible to the lay reader. Table II, showing for Sleighton Farms their first parole placements according to causes of return, is not as clear to the untrained reader as it might be. The advisability of including percentages in a table where the total number of cases is quite small seems rather debatable. Only 22 cases from the Midnight Mission were studied and yet the items making up this total of 22 are distributed according to percents. Where the total number of cases is less than 100 it is seldom desirable to include a percentage table.

This first Bulletin seems to promise an interesting series of studies from the Bureau for Social Research of the Seybert Institution.

WM. B. B.

NEW STATISTICAL BOOKS ADDED TO BOSTON PUBLIC LIBRARY DURING QUARTER ENDING MARCH 31, 1916.

PREPARED BY LIBRARY COMMITTEE: ROGER W. BABSON, EDMUND E. DAY, HENRY J. HARRIS.

Donald, W. J. A. The Canadian iron and steel industry. A study in the economic history of a protected industry. Boston. 1915. Maps. Tables. [Hart, Schaffner & Marx Prize essays.] Bibliography, pp. 359–366. 9338.471

Dunbar, Donald Earl. The tin-plate industry. Boston. 1915. Charts. Tables. [Hart, Schaffner & Marx Prize essays.] Bibliography, pp. 125–128. An economic study of a protected industry. 9338.419a2

Haig, Robert Murray. The exemption of improvements from taxation in Canada and the United States. A report prepared for the Committee on Taxation of the City of New York. New York. 1915. Plans. Tables. 9033.373

Hasse, Adelheid Rosalia. Index of economic material in documents of the states of the United States. New Jersey. 1789–1904. Washington. 1914. [Carnegie Institution of Washington. Publication.] 9016.3073a13

Hepburn, Alonzo Barton. A history of currency in the United States. New York. 1915. Tables. Bibliography, pp. 479–495. 9332.4973a3

Huebner, Grover Gerhard. Agricultural commerce: the organization of American commerce in agricultural commodities. New York. 1915. Maps. Tables. Facsimiles. Bibliographies at the end of most chapters. 9380.73a6

Huebner, Solomon S. Life insurance: a text book. New York. 1915. Tables. Bibliographies at the ends of some chapters. 9368.3a65

International Institute of Agriculture, Rome. Bureau of General Statistics. Bulletin of agricultural and commercial statistics. [Monthly.] Vol. 2 (no. 11, 12), 3 (no. 2, 6–12), 4, 5. 1911–14. 9338.1a23

Shriver, J. Alexis. Canned-goods trade in the Far East. Washington. 1915. Tables. 9382.73a35.92

—Pineapple-canning industry of the world. Washington. 1915. 9382.73a35.91

United States. Department of Agriculture. Weekly news letter. Vol. 1–3 (no. 1–17). Washington. 1913–15. Illus. Plans. Previous to vol. 2, no. 35, April 14, 1915, the title was, Weekly news letter to crop correspondents. 9338.173a8

—Bureau of Foreign and Domestic Commerce. Banking and credit in Argentina, Brazil, Chile, and Peru. Prepared by Edward N. Hurley. Washington. 1914. Table. 9382.73a35.90

Economics of Retailing. By Paul H. Nystrom. Ronald Press Co., 20 Vesey St., New York, 1915. 407 pp. $2.00, postpaid.

The significance of this book to statisticians is its demonstration of the serious lack of fundamental statistical data in this great field of business

activity. It is possible to learn from the census reports how many establishments, employees, etc., are engaged in manufacturing, mining, and agriculture. The value of the products and the plants can also be ascertained in the same way; but nobody knows how many stores or storekeepers there are in the country and nobody can find out how many people are employed or how much they earn in the aggregate. It is a matter of common knowledge that an increasing proportion of the incomes of the people of this country are being expended in retail stores, year by year. But neither the amount of the gross income of the people, nor the proportion so expended is known with even approximate accuracy.

There can be no doubt that the retail store is one of the most important links in the chain of activities and processes by which the wants of the consumers are met by a ceaseless flow of goods from producers. It would be interesting and enlightening to know just how much this service costs. The author states that the "distribution" of goods, which includes transportation, insurance, and storage as well as the selling, probably costs more than the manufacturing. It is generally recognized that there is great inefficiency and waste in retailing. Here then is the place where statistics should be made available, if we are to deal intelligently with the rising cost of living.

The author has made excellent use of what figures he could get while at the same time he points out their inaccuracies and inadequacy.

The work is what the title indicates, a study of the economics of retailing. It combines in a very effective way the descriptive and analytical methods of treatment. It fits in splendidly between general economics on the one hand and the handbooks and treatises of a more technical character in business management and salesmanship on the other. It supplements general economics where many students have felt the need of a fuller treatment, and it affords a historical background and a scientific groundwork for the art of the merchant and the salesman.

The book is well written and is presented in a satisfactory typography. It should be interesting and easy reading for both business men and student.

CARROLL W. DOTEN.

Massachusetts Institute of Technology.

RESOLUTION.

At a Meeting of the American Statistical Association, held in New York City, May 5, 1916, the following resolution was adopted by unanimous vote of the members present:

WHEREAS, The Joint Resolution introduced in Congress by Senator John D. Works, of California, making it unlawful for any officer or employee of the United States Public Health Service to be, or to become, a member or officer of, or in any way connected with, any medical or private health association or organization of any kind, if passed by Congress, would limit the usefulness of a very important branch of government service; and

WHEREAS, It would deprive the public health and statistical associations of the country of the benefit that accrues to them and to the public at large from the direct contact and association with the officers of the United States Public Health Service, who have contributed largely to the knowledge of disease and its prevention; and

WHEREAS, The efficiency of the government service is enhanced by the participation of its officers in the activities of scientific societies; and

WHEREAS, The principle underlying Senator Works' resolution, if applied in one branch of the government service, might be extended to other branches and impose regrettable limitations upon the usefulness of government officers pursuing scientific work,

Therefore, Be it Resolved, That the American Statistical Association hereby records its emphatic disapproval of Senator Works' Resolution; and

Be it Further Resolved, That copies of this resolution be sent to the members of the Committees of Congress to which this resolution was referred and that it be given publicity in the daily press of the country.

Attest:

CARROLL W. DOTEN,
Secretary.

COMMITTEES.

The following committees have been appointed since the Proceedings of the Annual Meeting were published:

Committee on Fellows:

Frederick L. Hoffman, term expires 1920.
E. Dana Durand, term expires 1919.
Wesley C. Mitchell, term expires 1918.
Charles H. Verrill, term expires 1917.
John L. Coulter, term expires 1916.

Nominating Committee:

William Z. Ripley, chairman, Fred C. Croxton, W. S. Gifford.

Members of Committee on Local Arrangements: (Annual Meeting, Columbus, Ohio.)

Fred C. Croxton, Mary Louise Marks, and Carl J. West.

Publications of the American Statistical Association.

The New Series of the Association, issued quarterly, will be sent to members of the Association on payment of the annual dues of two dollars. The subscription price is also two dollars per annum. Separate copies can also be purchased upon remittance of the advertised prices.

The following list of titles includes only the most important papers published in the several issues. There is in addition a considerable amount of miscellaneous material.

VOL. I. 1888-1889. Nos. 1-8. Pp. 492. PRICE $4.00.

No. 1. Statistics of Water Power Employed in Manufacturing in the United States. GEORGE F. SWAIN. 75 cents.

Nos. 2, 3. Park Areas and Open-Air Spaces in American Cities. E. R. L. GOULD.

Key to the Publications of the United States Census, 1790-1887; with Occasional References to Other Statistical Works. EDWARD CLARK LUNT. $1.00.

No. 4. Life Insurance in the United States. WALTER C. WRIGHT. $1.00.

No. 5. Notes on the Statistical Determination of the Causes of Poverty. AMOS G. WARNER. REMARKS. SAMUEL W. DIKE.

Statistics of Divorce in the United States and Europe. SAMUEL W. DIKE. 50 cents.

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Statistics of Municipal Finance. HENRY B. GARDNER. 75 cents.

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No. 8. Finance Statistics of the American Commonwealths. EDWIN R. A. SELIGMAN.

Divorce in France. BENJAMIN F. KELLER.

Relief of the Poor in Germany. A. G. WARNER. $1.00.

VOL. II. 1890-1891. Nos. 9-16. Pp. 470. PRICE $4.00.

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Rate of Natural Increase of Population in United States. HERMAN HOLLERITH.

The First Census of Massachusetts. SAMUEL A. GREEN.

The Commercial Death Rate. ALBERT C. STEVENS. $1.00.

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Development of Statistics of Religions. M. FOURNIER DE FLAIX. TRANSLATED BY ALICE R. JACKSON.
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